



#110

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SEQUENCE LISTING

<110> Bayer Aktiengesellschaft

<120> Nucleic acids coding for enzyme activities of
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<140> US/10/069,353

<141> 2000-08-17

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<170> PatentIn Ver. 2.1

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| Glu Lys Tyr Ala His Asp Met Gly Tyr Ala Ile Leu Thr Ala Arg Lys | 260 | 265 | 270 | |
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 Ile Ala Ala Pro Pro Glu Leu Gln Ala Thr Ala His Gly Ala Gly Leu
 35 40 45
 acc acg gcc ggg atc cgc ggg aac gac agg acc ggc gat acg ggt gga 192
 Thr Thr Ala Gly Ile Arg Gly Asn Asp Arg Thr Gly Asp Thr Gly Gly
 50 55 60
 acc acg cag ctg cgc ttt ccc aat ccg gcg ttc ggt cag cgc gac acc 240
 Thr Thr Gln Leu Arg Phe Pro Asn Pro Ala Phe Gly Gln Arg Asp Thr
 65 70 75 80
 gag gca ggc cgg caa ctg tgg gag cag acc gcg tcc aat gtc gcg caa 288
 Glu Ala Gly Arg Gln Leu Trp Glu Gln Thr Ala Ser Asn Val Ala Gln
 85 90 95
 agc tcg ctc gat cag ctc ccc gaa tac ctt cga ctg gcc gag gcc tgg 336
 Ser Ser Leu Asp Gln Leu Pro Glu Tyr Leu Arg Leu Ala Glu Ala Trp
 100 105 110
 cga ccg tca gtg ctg ttg gtc gac gtc tgc gcg ctg atc ggc cgg gtg 384
 Arg Pro Ser Val Leu Leu Val Asp Val Cys Ala Leu Ile Gly Arg Val
 115 120 125
 ctc ggc gga ttg ctc gac ctg ccg gtc gtg ctg cac cgc tgg gga gtc 432
 Leu Gly Gly Leu Leu Asp Leu Pro Val Val Leu His Arg Trp Gly Val
 130 135 140
 gac ccc acc gca ggc ccc ttc agc gat cga gcc cac gag ttg ctt gac 480
 Asp Pro Thr Ala Gly Pro Phe Ser Asp Arg Ala His Glu Leu Leu Asp
 145 150 155 160
 ccg gtg tgc cgg cac cac gga ctg acc ggc ctg ccc act ccc gag ctc 528
 Pro Val Cys Arg His His Gly Leu Thr Gly Leu Pro Thr Pro Glu Leu
 165 170 175

| | |
|-----------------------------------------------------------------|------|
| atc ctc gat ccc tgt ccg ccg agc ctg caa gca agc gac gcg ccg caa | 576 |
| Ile Leu Asp Pro Cys Pro Pro Ser Leu Gln Ala Ser Asp Ala Pro Gln | |
| 180 185 190 | |
| ggc gca ccg gtc cag tac gtg ccg tac aac gga agc ggc gca ttc ccg | 624 |
| Gly Ala Pro Val Gln Tyr Val Pro Tyr Asn Gly Ser Gly Ala Phe Pro | |
| 195 200 205 | |
| gca tgg ggc gcg gcg cgc acc tca gca cgg cgg gtc tgc atc tgc atg | 672 |
| Ala Trp Gly Ala Ala Arg Thr Ser Ala Arg Arg Val Cys Ile Cys Met | |
| 210 215 220 | |
| ggc cgc atg gtg ctg aac gcc acc ggg ccg gct ccg ctg ctg cgc gca | 720 |
| Gly Arg Met Val Leu Asn Ala Thr Gly Pro Ala Pro Leu Leu Arg Ala | |
| 225 230 235 240 | |
| gta gcg gct gcc acc gag ttg ccc ggc gtc gag gcc gtg atc gcc gtt | 768 |
| Val Ala Ala Ala Thr Glu Leu Pro Gly Val Glu Ala Val Ile Ala Val | |
| 245 250 255 | |
| ccc ccc gag cac cgg gca ctt ctc acc gac cta ccc gac aac gcc cgg | 816 |
| Pro Pro Glu His Arg Ala Leu Leu Thr Asp Leu Pro Asp Asn Ala Arg | |
| 260 265 270 | |
| atc gcc gaa tcg gtc ccg ctc aac ctg ttc ctg cgt acc tgc gag ctg | 864 |
| Ile Ala Glu Ser Val Pro Leu Asn Leu Phe Leu Arg Thr Cys Glu Leu | |
| 275 280 285 | |
| gtc atc tgc gcg ggc ggc tcg gga acg gca ttc acc gcg acc cga ctc | 912 |
| Val Ile Cys Ala Gly Gly Ser Gly Thr Ala Phe Thr Ala Thr Arg Leu | |
| 290 295 300 | |
| ggc atc ccg caa ctc gtg ctt ccc cag tac ttc gac cag ttc gac tac | 960 |
| Gly Ile Pro Gln Leu Val Leu Pro Gln Tyr Phe Asp Gln Phe Asp Tyr | |
| 305 310 315 320 | |
| gcg cgc aac ctc gcc gct gcc ggg gcg ggc atc tgc ttg ccg gat gag | 1008 |
| Ala Arg Asn Leu Ala Ala Ala Gly Ala Gly Ile Cys Leu Pro Asp Glu | |
| 325 330 335 | |
| cag gcc cag tcc gac cac gaa cag ttc acc gac tca atc gca acg gtg | 1056 |
| Gln Ala Gln Ser Asp His Glu Gln Phe Thr Asp Ser Ile Ala Thr Val | |
| 340 345 350 | |
| ctc ggc gac acc ggc ttc gct gct gcg gca atc aaa ctc agc gac gag | 1104 |
| Leu Gly Asp Thr Gly Phe Ala Ala Ala Ala Ile Lys Leu Ser Asp Glu | |
| 355 360 365 | |
| atc acg gcc atg ccc cat ccc gcc gcg ctg gtg cgg acg ctg gag aac | 1152 |
| Ile Thr Ala Met Pro His Pro Ala Ala Leu Val Arg Thr Leu Glu Asn | |
| 370 375 380 | |
| act gcg gcc atc cgt gcc tga | 1173 |
| Thr Ala Ala Ile Arg Ala | |
| 385 390 | |

<210> 10
<211> 390
<212> PRT
<213> Saccharopolyspora spinosa

<400> 10

Met Arg Val Leu Val Val Pro Leu Pro Tyr Pro Thr His Leu Met Ala
1 5 10 15

Met Val Pro Leu Cys Trp Ala Leu Gln Ala Ser Gly His Glu Val Leu
20 25 30

Ile Ala Ala Pro Pro Glu Leu Gln Ala Thr Ala His Gly Ala Gly Leu
35 40 45

Thr Thr Ala Gly Ile Arg Gly Asn Asp Arg Thr Gly Asp Thr Gly Gly
50 55 60

Thr Thr Gln Leu Arg Phe Pro Asn Pro Ala Phe Gly Gln Arg Asp Thr
65 70 75 80

Glu Ala Gly Arg Gln Leu Trp Glu Gln Thr Ala Ser Asn Val Ala Gln
85 90 95

Ser Ser Leu Asp Gln Leu Pro Glu Tyr Leu Arg Leu Ala Glu Ala Trp
100 105 110

Arg Pro Ser Val Leu Leu Val Asp Val Cys Ala Leu Ile Gly Arg Val
115 120 125

Leu Gly Gly Leu Leu Asp Leu Pro Val Val Leu His Arg Trp Gly Val
130 135 140

Asp Pro Thr Ala Gly Pro Phe Ser Asp Arg Ala His Glu Leu Leu Asp
145 150 155 160

Pro Val Cys Arg His His Gly Leu Thr Gly Leu Pro Thr Pro Glu Leu
165 170 175

Ile Leu Asp Pro Cys Pro Pro Ser Leu Gln Ala Ser Asp Ala Pro Gln
180 185 190

Gly Ala Pro Val Gln Tyr Val Pro Tyr Asn Gly Ser Gly Ala Phe Pro
195 200 205

Ala Trp Gly Ala Ala Arg Thr Ser Ala Arg Arg Val Cys Ile Cys Met
210 215 220

Gly Arg Met Val Leu Asn Ala Thr Gly Pro Ala Pro Leu Leu Arg Ala
225 230 235 240

Val Ala Ala Ala Thr Glu Leu Pro Gly Val Glu Ala Val Ile Ala Val
245 250 255

Pro Pro Glu His Arg Ala Leu Leu Thr Asp Leu Pro Asp Asn Ala Arg
260 265 270

Ile Ala Glu Ser Val Pro Leu Asn Leu Phe Leu Arg Thr Cys Glu Leu
 275 280 285
 Val Ile Cys Ala Gly Gly Ser Gly Thr Ala Phe Thr Ala Thr Arg Leu
 290 295 300
 Gly Ile Pro Gln Leu Val Leu Pro Gln Tyr Phe Asp Gln Phe Asp Tyr
 305 310 315 320
 Ala Arg Asn Leu Ala Ala Ala Gly Ala Gly Ile Cys Leu Pro Asp Glu
 325 330 335
 Gln Ala Gln Ser Asp His Glu Gln Phe Thr Asp Ser Ile Ala Thr Val
 340 345 350
 Leu Gly Asp Thr Gly Phe Ala Ala Ala Ala Ile Lys Leu Ser Asp Glu
 355 360 365
 Ile Thr Ala Met Pro His Pro Ala Ala Leu Val Arg Thr Leu Glu Asn
 370 375 380
 Thr Ala Ala Ile Arg Ala
 385 390

<210> 11
 <211> 753
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(750)
 <223> ORF3; O-methyltransferase

<400> 11
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 Met Pro Ser Gln Asn Ala Leu Tyr Leu Asp Leu Leu Lys Lys Val Leu
 1 5 10 15
 acc aac acg att tac agt gat cgg ccg cat ccg aac gcc tgg cag gac 96
 Thr Asn Thr Ile Tyr Ser Asp Arg Pro His Pro Asn Ala Trp Gln Asp
 20 25 30
 aac acc gac tac agg cag gcc gct cgg gcc aaa ggc acg gac tgg cca 144
 Asn Thr Asp Tyr Arg Gln Ala Ala Arg Ala Lys Gly Thr Asp Trp Pro
 35 40 45
 act gtc gcg cac acg atg atc ggt ctg gag cgg ctg gac aac ctc cag 192
 Thr Val Ala His Thr Met Ile Gly Leu Glu Arg Leu Asp Asn Leu Gln
 50 55 60
 cac tgc gtg gaa gcc gtg ctc gca gac ggt gtt ccc ggg gat ttc gcc 240
 His Cys Val Glu Ala Val Leu Ala Asp Gly Val Pro Gly Asp Phe Ala
 65 70 75 80

| | |
|-----------------------------------------------------------------|-----|
| gag acc ggt gtc tgg cgg ggc ggc gca tgc atc ttc atg cgc gcg gtt | 288 |
| Glu Thr Gly Val Trp Arg Gly Gly Ala Cys Ile Phe Met Arg Ala Val | |
| 85 90 95 | |
| | |
| ctc cag gca ttc gga gat acc gga cgt acc gtc tgg gta gtg gat tcc | 336 |
| Leu Gln Ala Phe Gly Asp Thr Gly Arg Thr Val Trp Val Val Asp Ser | |
| 100 105 110 | |
| | |
| ttc cag gga atg ccg gaa agc tct gcg caa gac cac caa gcg gac cag | 384 |
| Phe Gln Gly Met Pro Glu Ser Ser Ala Gln Asp His Gln Ala Asp Gln | |
| 115 120 125 | |
| | |
| gct atg gcg ctg cac gag tac aac gac gtg ctt ggc gta tcg ctt gag | 432 |
| Ala Met Ala Leu His Glu Tyr Asn Asp Val Leu Gly Val Ser Leu Glu | |
| 130 135 140 | |
| | |
| acc gtc cgg cag aac ttc gcc cgc tac ggg ctg ctc gac gaa cag gtc | 480 |
| Thr Val Arg Gln Asn Phe Ala Arg Tyr Gly Leu Leu Asp Glu Gln Val | |
| 145 150 155 160 | |
| | |
| agg ttc ctc ccc ggc tgg ttc cgg gac acc ttg ccc acc gcc ccc atc | 528 |
| Arg Phe Leu Pro Gly Trp Phe Arg Asp Thr Leu Pro Thr Ala Pro Ile | |
| 165 170 175 | |
| | |
| cag gaa ctc gcc gtg cta cga ctc gac ggc gac ctc tac gaa tcc aca | 576 |
| Gln Glu Leu Ala Val Leu Arg Leu Asp Gly Asp Leu Tyr Glu Ser Thr | |
| 180 185 190 | |
| | |
| atg gac tca ttg cgg aac ctg tac ccg aag ctc tcg ccg ggc gga ttc | 624 |
| Met Asp Ser Leu Arg Asn Leu Tyr Pro Lys Leu Ser Pro Gly Gly Phe | |
| 195 200 205 | |
| | |
| gtc atc atc gac gac tat ttt ctg ccg tcc tgc cag gac gcg gtg aag | 672 |
| Val Ile Ile Asp Asp Tyr Phe Leu Pro Ser Cys Gln Asp Ala Val Lys | |
| 210 215 220 | |
| | |
| ggg ttc cgc gcg gaa ctc ggg atc acg gaa ccc atc cac gac atc gac | 720 |
| Gly Phe Arg Ala Glu Leu Gly Ile Thr Glu Pro Ile His Asp Ile Asp | |
| 225 230 235 240 | |
| | |
| ggc acg ggc gcc tac tgg cgc cgc agc tgg tga | 753 |
| Gly Thr Gly Ala Tyr Trp Arg Arg Ser Trp | |
| 245 250 | |

<210> 12

<211> 250

<212> PRT

<213> Saccharopolyspora spinosa

<400> 12

| |
|-----------------------------------------------------------------|
| Met Pro Ser Gln Asn Ala Leu Tyr Leu Asp Leu Leu Lys Lys Val Leu |
| 1 5 10 15 |

| |
|-----------------------------------------------------------------|
| Thr Asn Thr Ile Tyr Ser Asp Arg Pro His Pro Asn Ala Trp Gln Asp |
| 20 25 30 |

Asn Thr Asp Tyr Arg Gln Ala Ala Arg Ala Lys Gly Thr Asp Trp Pro
 35 40 45
 Thr Val Ala His Thr Met Ile Gly Leu Glu Arg Leu Asp Asn Leu Gln
 50 55 60
 His Cys Val Glu Ala Val Leu Ala Asp Gly Val Pro Gly Asp Phe Ala
 65 70 75 80
 Glu Thr Gly Val Trp Arg Gly Gly Ala Cys Ile Phe Met Arg Ala Val
 85 90 95
 Leu Gln Ala Phe Gly Asp Thr Gly Arg Thr Val Trp Val Val Asp Ser
 100 105 110
 Phe Gln Gly Met Pro Glu Ser Ser Ala Gln Asp His Gln Ala Asp Gln
 115 120 125
 Ala Met Ala Leu His Glu Tyr Asn Asp Val Leu Gly Val Ser Leu Glu
 130 135 140
 Thr Val Arg Gln Asn Phe Ala Arg Tyr Gly Leu Leu Asp Glu Gln Val
 145 150 155 160
 Arg Phe Leu Pro Gly Trp Phe Arg Asp Thr Leu Pro Thr Ala Pro Ile
 165 170 175
 Gln Glu Leu Ala Val Leu Arg Leu Asp Gly Asp Leu Tyr Glu Ser Thr
 180 185 190
 Met Asp Ser Leu Arg Asn Leu Tyr Pro Lys Leu Ser Pro Gly Gly Phe
 195 200 205
 Val Ile Ile Asp Asp Tyr Phe Leu Pro Ser Cys Gln Asp Ala Val Lys
 210 215 220
 Gly Phe Arg Ala Glu Leu Gly Ile Thr Glu Pro Ile His Asp Ile Asp
 225 230 235 240
 Gly Thr Gly Ala Tyr Trp Arg Arg Ser Trp
 245 250

<210> 13
 <211> 1188
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(1185)
 <223> ORF4; O-methyltransferase

<400> 13
 atg agt gag atc gca gtt gcc ccc tgg tcg gtg gtg gag cgt ttg ctg 48

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Glu | Ile | Ala | Val | Ala | Pro | Trp | Ser | Val | Val | Glu | Arg | Leu | Leu | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| ctc | gcg | gcg | ggt | gcg | ggc | ccg | gcg | aag | ctc | cag | gaa | gca | gtg | cag | gtg | 96 |
| Leu | Ala | Ala | Gly | Ala | Gly | Pro | Ala | Lys | Leu | Gln | Glu | Ala | Val | Gln | Val | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| gcc | gga | ctg | gac | gcg | gtg | gcc | gac | gcc | atc | gtc | gac | gaa | ctc | gtc | gta | 144 |
| Ala | Gly | Leu | Asp | Ala | Val | Ala | Asp | Ala | Ile | Val | Asp | Glu | Leu | Val | Val | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| cgc | tgc | gat | ccg | ctg | tcg | ttg | gac | gag | tcg | gtg | cga | atc | ggc | ctg | gag | 192 |
| Arg | Cys | Asp | Pro | Leu | Ser | Leu | Asp | Glu | Ser | Val | Arg | Ile | Gly | Leu | Glu | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| atc | act | tct | ggc | gct | cag | ctg | gtc | cgg | aga | acc | gtt | gag | ctc | gat | cac | 240 |
| Ile | Thr | Ser | Gly | Ala | Gln | Leu | Val | Arg | Arg | Thr | Val | Glu | Leu | Asp | His | |
| 65 | | | | | 70 | | | | 75 | | | | | 80 | | |
| gca | ggc | ctg | cgg | ctc | gcg | gcg | gtc | gcc | gaa | gca | gct | gct | gtt | ctc | cgg | 288 |
| Ala | Gly | Leu | Arg | Leu | Ala | Ala | Val | Ala | Glu | Ala | Ala | Ala | Val | Leu | Arg | |
| | | | | 85 | | | | 90 | | | | | | 95 | | |
| ttc | gac | gcg | gtg | gat | ctg | ctg | gaa | ggg | ctc | ttc | ggc | ccg | gtt | gac | ggc | 336 |
| Phe | Asp | Ala | Val | Asp | Leu | Leu | Glu | Gly | Leu | Phe | Gly | Pro | Val | Asp | Gly | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| agg | cgg | cac | aac | agc | cgt | gaa | gtc | cgc | tgg | tcg | gac | agc | atg | acg | cag | 384 |
| Arg | Arg | His | Asn | Ser | Arg | Glu | Val | Arg | Trp | Ser | Asp | Ser | Met | Thr | Gln | |
| | | 115 | | | | 120 | | | | | | 125 | | | | |
| ttc | tcg | ccc | gac | cag | ggc | ctc | gcc | ggc | gcg | cag | cgc | ctg | ctg | gcg | ttc | 432 |
| Phe | Ser | Pro | Asp | Gln | Gly | Leu | Ala | Gly | Ala | Gln | Arg | Leu | Leu | Ala | Phe | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| cgg | aac | agg | gtg | tcc | acc | gcg | gtg | cac | gcc | gtg | ctg | gcc | gca | gcc | gcc | 480 |
| Arg | Asn | Arg | Val | Ser | Thr | Ala | Val | His | Ala | Val | Leu | Ala | Ala | Ala | Ala | |
| 145 | | | | | 150 | | | | | 155 | | | | 160 | | |
| acc | agg | cgc | gcg | gac | ctc | ggc | gcg | ctg | gca | gtc | cgc | tac | gga | tcc | gac | 528 |
| Thr | Arg | Arg | Ala | Asp | Leu | Gly | Ala | Leu | Ala | Val | Arg | Tyr | Gly | Ser | Asp | |
| | | | | 165 | | | | 170 | | | | | | 175 | | |
| aaa | tgg | gcg | gac | ctg | cac | tgg | tac | acc | gaa | cac | tac | gag | cac | cac | ttc | 576 |
| Lys | Trp | Ala | Asp | Leu | His | Trp | Tyr | Thr | Glu | His | Tyr | Glu | His | His | Phe | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| tcc | cga | ttc | cag | gat | gcc | ccg | gtg | cga | gtg | ttg | gaa | ata | gga | atc | ggc | 624 |
| Ser | Arg | Phe | Gln | Asp | Ala | Pro | Val | Arg | Val | Leu | Glu | Ile | Gly | Ile | Gly | |
| | | 195 | | | | 200 | | | | | | 205 | | | | |
| ggc | tat | cac | gca | ccc | gaa | ctc | ggc | ggc | gct | tcg | ctg | cgc | atg | tgg | cag | 672 |
| Gly | Tyr | His | Ala | Pro | Glu | Leu | Gly | Gly | Ala | Ser | Leu | Arg | Met | Trp | Gln | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| cgg | tac | ttc | cgg | cga | ggc | ctc | gtt | tac | ggg | ctg | gac | att | ttc | gag | aaa | 720 |
| Arg | Tyr | Phe | Arg | Arg | Gly | Leu | Val | Tyr | Gly | Leu | Asp | Ile | Phe | Glu | Lys | |

| 225 | 230 | 235 | 240 | |
|-----------------------------------------------------------------|-----|-----|-----|------|
| gcc ggg aac gaa ggg cac cga gtg cga aag ctg cga ggt gac cag agc | | | | 768 |
| Ala Gly Asn Glu Gly His Arg Val Arg Lys Leu Arg Gly Asp Gln Ser | 245 | 250 | 255 | |
| gat gcg gaa ttc ctg gaa gac atg gcg ggg aag atc ggg ccg ttc gac | | | | 816 |
| Asp Ala Glu Phe Leu Glu Asp Met Ala Gly Lys Ile Gly Pro Phe Asp | 260 | 265 | 270 | |
| att gtc atc gac gac ggc agc cat gtc aac gac cac gtc aag aaa tcc | | | | 864 |
| Ile Val Ile Asp Asp Gly Ser His Val Asn Asp His Val Lys Lys Ser | 275 | 280 | 285 | |
| ttc caa tcc ctg ttt ccg cac gtc cgc cca ggt ggt ttg tac gtc atc | | | | 912 |
| Phe Gln Ser Leu Phe Pro His Val Arg Pro Gly Gly Leu Tyr Val Ile | 290 | 295 | 300 | |
| gag gat ctc cag acg gcg tac tgg ccc ggc tac ggc ggt cgc gat ggg | | | | 960 |
| Glu Asp Leu Gln Thr Ala Tyr Trp Pro Gly Tyr Gly Gly Arg Asp Gly | 305 | 310 | 315 | 320 |
| gaa ccc gcg gcc cag cgc acc tcg atc gac atg ctc aaa gaa ctg atc | | | | 1008 |
| Glu Pro Ala Ala Gln Arg Thr Ser Ile Asp Met Leu Lys Glu Leu Ile | 325 | 330 | 335 | |
| gac ggc ctg cat tat cag gag cgc gaa tcg cgg tgc ggg acc gag ccc | | | | 1056 |
| Asp Gly Leu His Tyr Gln Glu Arg Glu Ser Arg Cys Gly Thr Glu Pro | 340 | 345 | 350 | |
| tcc tac acg gaa cgg aac gtg gcg gcc ctg cac ttc tac cac aac ctg | | | | 1104 |
| Ser Tyr Thr Glu Arg Asn Val Ala Ala Leu His Phe Tyr His Asn Leu | 355 | 360 | 365 | |
| gta ttc gtg gag aaa ggg ctc aac gct gag cct gcc gcg ccg ggg ttc | | | | 1152 |
| Val Phe Val Glu Lys Gly Leu Asn Ala Glu Pro Ala Ala Pro Gly Phe | 370 | 375 | 380 | |
| gtg ccc cgg caa gcg ctc ggc gtc gag gac ggc tga | | | | 1188 |
| Val Pro Arg Gln Ala Leu Gly Val Glu Asp Gly | 385 | 390 | 395 | |

<210> 14

<211> 395

<212> PRT

<213> Saccharopolyspora spinosa

<400> 14

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Glu | Ile | Ala | Val | Ala | Pro | Trp | Ser | Val | Val | Glu | Arg | Leu | Leu |
| 1 | | | | 5 | | | | 10 | | | | | | 15 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Ala | Ala | Gly | Ala | Gly | Pro | Ala | Lys | Leu | Gln | Glu | Ala | Val | Gln | Val |
| | | | 20 | | | | | 25 | | | | | 30 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Gly | Leu | Asp | Ala | Val | Ala | Asp | Ala | Ile | Val | Asp | Glu | Leu | Val | Val |
| | | 35 | | | | | 40 | | | | | 45 | | | |

| | | | | | | | | | | | | | | | |
|------------|-----|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Arg 50 | Cys | Asp | Pro | Leu | Ser | Leu 55 | Asp | Glu | Ser | Val | Arg 60 | Ile | Gly | Leu | Glu |
| Ile 65 | Thr | Ser | Gly | Ala | Gln 70 | Leu | Val | Arg | Arg | Thr 75 | Val | Glu | Leu | Asp | His 80 |
| Ala | Gly | Leu | Arg | Leu 85 | Ala | Ala | Val | Ala | Glu 90 | Ala | Ala | Ala | Val | Leu 95 | Arg |
| Phe | Asp | Ala | Val 100 | Asp | Leu | Leu | Glu | Gly 105 | Leu | Phe | Gly | Pro | Val 110 | Asp | Gly |
| Arg | Arg | His 115 | Asn | Ser | Arg | Glu | Val 120 | Arg | Trp | Ser | Asp | Ser 125 | Met | Thr | Gln |
| Phe 130 | Ser | Pro | Asp | Gln | Gly | Leu 135 | Ala | Gly | Ala | Gln | Arg 140 | Leu | Leu | Ala | Phe |
| Arg 145 | Asn | Arg | Val | Ser | Thr 150 | Ala | Val | His | Ala | Val 155 | Leu | Ala | Ala | Ala | Ala 160 |
| Thr | Arg | Arg | Ala | Asp 165 | Leu | Gly | Ala | Leu | Ala 170 | Val | Arg | Tyr | Gly | Ser 175 | Asp |
| Lys | Trp | Ala | Asp 180 | Leu | His | Trp | Tyr | Thr 185 | Glu | His | Tyr | Glu | His 190 | His | Phe |
| Ser | Arg | Phe 195 | Gln | Asp | Ala | Pro | Val 200 | Arg | Val | Leu | Glu | Ile 205 | Gly | Ile | Gly |
| Gly 210 | Tyr | His | Ala | Pro | Glu | Leu 215 | Gly | Gly | Ala | Ser | Leu 220 | Arg | Met | Trp | Gln |
| Arg 225 | Tyr | Phe | Arg | Arg | Gly 230 | Leu | Val | Tyr | Gly | Leu 235 | Asp | Ile | Phe | Glu | Lys 240 |
| Ala | Gly | Asn | Glu | Gly 245 | His | Arg | Val | Arg | Lys 250 | Leu | Arg | Gly | Asp | Gln 255 | Ser |
| Asp | Ala | Glu | Phe 260 | Leu | Glu | Asp | Met | Ala 265 | Gly | Lys | Ile | Gly | Pro 270 | Phe | Asp |
| Ile | Val | Ile 275 | Asp | Asp | Gly | Ser | His 280 | Val | Asn | Asp | His 285 | Val | Lys | Lys | Ser |
| Phe 290 | Gln | Ser | Leu | Phe | Pro | His 295 | Val | Arg | Pro | Gly | Gly 300 | Leu | Tyr | Val | Ile |
| Glu 305 | Asp | Leu | Gln | Thr | Ala 310 | Tyr | Trp | Pro | Gly | Tyr 315 | Gly | Gly | Arg | Asp | Gly 320 |
| Glu | Pro | Ala | Ala | Gln 325 | Arg | Thr | Ser | Ile | Asp 330 | Met | Leu | Lys | Glu | Leu 335 | Ile |
| Asp | Gly | Leu | His 340 | Tyr | Gln | Glu | Arg | Glu 345 | Ser | Arg | Cys | Gly | Thr 350 | Glu | Pro |

Ser Tyr Thr Glu Arg Asn Val Ala Ala Leu His Phe Tyr His Asn Leu
355 360 365

Val Phe Val Glu Lys Gly Leu Asn Ala Glu Pro Ala Ala Pro Gly Phe
370 375 380

Val Pro Arg Gln Ala Leu Gly Val Glu Asp Gly
385 390 395

<210> 15
<211> 1620
<212> DNA
<213> Saccharopolyspora spinosa

<220>
<221> CDS
<222> (1)..(1617)
<223> ORF5; C-C linking enzyme, cyclization enzyme

<400> 15
atg atc tcg gct gcg ggc gaa caa agt gga cca gtc aga aaa gga ggg 48
Met Ile Ser Ala Ala Gly Glu Gln Ser Gly Pro Val Arg Lys Gly Gly
1 5 10 15

gcg gtg ccc gaa ttc cat gac ccg gca ccc atg aat cgt cga acc cca 96
Ala Val Pro Glu Phe His Asp Pro Ala Pro Met Asn Arg Arg Thr Pro
20 25 30

gga aca gag atc acc gtc gag ccc gac gat cct cgt tat ccg gac ctc 144
Gly Thr Glu Ile Thr Val Glu Pro Asp Asp Pro Arg Tyr Pro Asp Leu
35 40 45

gtc gtc ggg cac aac ccc cgt ttc acc gga aaa ccc gaa cgc atc cac 192
Val Val Gly His Asn Pro Arg Phe Thr Gly Lys Pro Glu Arg Ile His
50 55 60

atc gcc agc tcc gcc gaa gac gtc gtg cac gcc gtc gcc gac gcc gtg 240
Ile Ala Ser Ser Ala Glu Asp Val Val His Ala Val Ala Asp Ala Val
65 70 75 80

cgc acc ggc agg cgg gta ggg gtc cgc agc ggc ggg cac tgc ttc gag 288
Arg Thr Gly Arg Arg Val Gly Val Arg Ser Gly Gly His Cys Phe Glu
85 90 95

aat ctc gtt gcg gac ccg gcg atc cga gtg ctc gtc gac ctc tcc gag 336
Asn Leu Val Ala Asp Pro Ala Ile Arg Val Leu Val Asp Leu Ser Glu
100 105 110

ctc aac cgc gtg tac tac gac agc acg cgc ggg gca ttc gcg atc gag 384
Leu Asn Arg Val Tyr Tyr Asp Ser Thr Arg Gly Ala Phe Ala Ile Glu
115 120 125

gcg ggc gcc gcc ctc ggg cag gtg tac cga acc ctg ttc aag aac tgg 432
Ala Gly Ala Ala Leu Gly Gln Val Tyr Arg Thr Leu Phe Lys Asn Trp

| 130 | 135 | 140 | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| ggc gtg acg atc ccg acc ggc gca tgt ccc ggg gtg ggc gca ggc ggg Gly Val Thr Ile Pro Thr Gly Ala Cys Pro Gly Val Gly Ala Gly Gly 145 150 155 160 | | | 480 |
| cac atc ctc ggc ggg gga tac ggc ccg ctg tcg cgc cga ttc ggt tcg His Ile Leu Gly Gly Gly Tyr Gly Pro Leu Ser Arg Arg Phe Gly Ser 165 170 175 | | | 528 |
| gtc gtc gac tac ctt caa ggc gtc gag gtc gtc gtg gtc gac cag gcc Val Val Asp Tyr Leu Gln Gly Val Glu Val Val Val Val Asp Gln Ala 180 185 190 | | | 576 |
| ggg gaa gtg cac atc gtc gag gcc gac ccg aac tcc acg ggc gcc ggt Gly Glu Val His Ile Val Glu Ala Asp Arg Asn Ser Thr Gly Ala Gly 195 200 205 | | | 624 |
| cac gac ttg tgg tgg gcg cac acc ggt ggc ggt ggc ggc aac ttc ggg His Asp Leu Trp Trp Ala His Thr Gly Gly Gly Gly Gly Asn Phe Gly 210 215 220 | | | 672 |
| atc gtc acc agg ttt tgg ctc cga acg ccg gac gtg gtc agc acc gac Ile Val Thr Arg Phe Trp Leu Arg Thr Pro Asp Val Val Ser Thr Asp 225 230 235 240 | | | 720 |
| gcc gca gag ctc ctg cca ccg ccg ccc gcg aca gtg ctg ctc cga tcg Ala Ala Glu Leu Leu Pro Arg Pro Pro Ala Thr Val Leu Leu Arg Ser 245 250 255 | | | 768 |
| ttc cac tgg ccg tgg cac gaa ctg aca gag cag tca ttc gcc gtg ctc Phe His Trp Pro Trp His Glu Leu Thr Glu Gln Ser Phe Ala Val Leu 260 265 270 | | | 816 |
| cta cag aac ttc ggc aat tgg tac gag cag cac agc gcg cct gaa tcc Leu Gln Asn Phe Gly Asn Trp Tyr Glu Gln His Ser Ala Pro Glu Ser 275 280 285 | | | 864 |
| acg caa ctc ggg ttg ttc agc acg ctc gtc tgc gca cac ccg caa gct Thr Gln Leu Gly Leu Phe Ser Thr Leu Val Cys Ala His Arg Gln Ala 290 295 300 | | | 912 |
| ggc tac gtc acg ctg aac gtt cac ctg gac ggc acg gat ccg aac gcg Gly Tyr Val Thr Leu Asn Val His Leu Asp Gly Thr Asp Pro Asn Ala 305 310 315 320 | | | 960 |
| gaa cgc acc ctg gcc gaa cac ctg tcg gcg atc aac gcc cag gtc ggc Glu Arg Thr Leu Ala Glu His Leu Ser Ala Ile Asn Ala Gln Val Gly 325 330 335 | | | 1008 |
| gtg act cca gcc gaa ggg ctg ccg gaa acc ctg ccg tgg ttg cga tcg Val Thr Pro Ala Glu Gly Leu Arg Glu Thr Leu Pro Trp Leu Arg Ser 340 345 350 | | | 1056 |
| acc cag gtg gcc ggg gcg atc gcc gaa ggc ggc gaa ccg ggc atg caa Thr Gln Val Ala Gly Ala Ile Ala Glu Gly Gly Glu Pro Gly Met Gln 355 360 365 | | | 1104 |

| | |
|-----------------------------------------------------------------|------|
| cgg acc aag gtc aaa gcc gcc tac ttg cgc acc ggg ctg tcc gaa gct | 1152 |
| Arg Thr Lys Val Lys Ala Ala Tyr Leu Arg Thr Gly Leu Ser Glu Ala | |
| 370 375 380 | |
| caa cta gcc acg gtt tac cgg cgg ctg acc gtc tac gga tac gac aac | 1200 |
| Gln Leu Ala Thr Val Tyr Arg Arg Leu Thr Val Tyr Gly Tyr Asp Asn | |
| 385 390 395 400 | |
| cct gcg gcg gcg ctg ttg ctg ctc ggt tac ggc ggt atg gcg aat gcc | 1248 |
| Pro Ala Ala Ala Leu Leu Leu Leu Gly Tyr Gly Gly Met Ala Asn Ala | |
| 405 410 415 | |
| gtg gct ccg tcg gcc acc gca ctc gct cag cgc gac tcg gtt ctc aaa | 1296 |
| Val Ala Pro Ser Ala Thr Ala Leu Ala Gln Arg Asp Ser Val Leu Lys | |
| 420 425 430 | |
| gcg ctg ttc gtc acg aac tgg tcg gag ccc gcc gag gac gag cgg cat | 1344 |
| Ala Leu Phe Val Thr Asn Trp Ser Glu Pro Ala Glu Asp Glu Arg His | |
| 435 440 445 | |
| ctg acc tgg att cgc ggt ttc tac cgc gag atg tac gcc gaa acc ggc | 1392 |
| Leu Thr Trp Ile Arg Gly Phe Tyr Arg Glu Met Tyr Ala Glu Thr Gly | |
| 450 455 460 | |
| gga gtt ccg gtg cca ggt acc cgt gtc gac ggc tcc tac atc aac tac | 1440 |
| Gly Val Pro Val Pro Gly Thr Arg Val Asp Gly Ser Tyr Ile Asn Tyr | |
| 465 470 475 480 | |
| ccg gac acc gac ttg gcc gat cca ttg tgg aac acc tcc ggt gtt gcc | 1488 |
| Pro Asp Thr Asp Leu Ala Asp Pro Leu Trp Asn Thr Ser Gly Val Ala | |
| 485 490 495 | |
| tgg cac gac ctg tac tac aaa gac aac tac ccg cgg ctg cag cgg gcc | 1536 |
| Trp His Asp Leu Tyr Tyr Lys Asp Asn Tyr Pro Arg Leu Gln Arg Ala | |
| 500 505 510 | |
| aaa gcg cgg tgg gat ccg cag aac atc ttc cag cac ggc ctg tcg atc | 1584 |
| Lys Ala Arg Trp Asp Pro Gln Asn Ile Phe Gln His Gly Leu Ser Ile | |
| 515 520 525 | |
| aaa ccg ccg gca cgg ctt tca ccc ggt cag cca tga | 1620 |
| Lys Pro Pro Ala Arg Leu Ser Pro Gly Gln Pro | |
| 530 535 | |

<210> 16

<211> 539

<212> PRT

<213> Saccharopolyspora spinosa

<400> 16

| |
|-----------------------------------------------------------------|
| Met Ile Ser Ala Ala Gly Glu Gln Ser Gly Pro Val Arg Lys Gly Gly |
| 1 5 10 15 |

| |
|-----------------------------------------------------------------|
| Ala Val Pro Glu Phe His Asp Pro Ala Pro Met Asn Arg Arg Thr Pro |
| 20 25 30 |

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Thr | Glu | Ile | Thr | Val | Glu | Pro | Asp | Asp | Pro | Arg | Tyr | Pro | Asp | Leu | 35 | 40 | 45 |
| Val | Val | Gly | His | Asn | Pro | Arg | Phe | Thr | Gly | Lys | Pro | Glu | Arg | Ile | His | 50 | 55 | 60 |
| Ile | Ala | Ser | Ser | Ala | Glu | Asp | Val | Val | His | Ala | Val | Ala | Asp | Ala | Val | 65 | 70 | 75 |
| Arg | Thr | Gly | Arg | Arg | Val | Gly | Val | Arg | Ser | Gly | Gly | His | Cys | Phe | Glu | 85 | 90 | 95 |
| Asn | Leu | Val | Ala | Asp | Pro | Ala | Ile | Arg | Val | Leu | Val | Asp | Leu | Ser | Glu | 100 | 105 | 110 |
| Leu | Asn | Arg | Val | Tyr | Tyr | Asp | Ser | Thr | Arg | Gly | Ala | Phe | Ala | Ile | Glu | 115 | 120 | 125 |
| Ala | Gly | Ala | Ala | Leu | Gly | Gln | Val | Tyr | Arg | Thr | Leu | Phe | Lys | Asn | Trp | 130 | 135 | 140 |
| Gly | Val | Thr | Ile | Pro | Thr | Gly | Ala | Cys | Pro | Gly | Val | Gly | Ala | Gly | Gly | 145 | 150 | 155 |
| His | Ile | Leu | Gly | Gly | Gly | Tyr | Gly | Pro | Leu | Ser | Arg | Arg | Phe | Gly | Ser | 165 | 170 | 175 |
| Val | Val | Asp | Tyr | Leu | Gln | Gly | Val | Glu | Val | Val | Val | Val | Asp | Gln | Ala | 180 | 185 | 190 |
| Gly | Glu | Val | His | Ile | Val | Glu | Ala | Asp | Arg | Asn | Ser | Thr | Gly | Ala | Gly | 195 | 200 | 205 |
| His | Asp | Leu | Trp | Trp | Ala | His | Thr | Gly | Gly | Gly | Gly | Gly | Asn | Phe | Gly | 210 | 215 | 220 |
| Ile | Val | Thr | Arg | Phe | Trp | Leu | Arg | Thr | Pro | Asp | Val | Val | Ser | Thr | Asp | 225 | 230 | 235 |
| Ala | Ala | Glu | Leu | Leu | Pro | Arg | Pro | Pro | Ala | Thr | Val | Leu | Leu | Arg | Ser | 245 | 250 | 255 |
| Phe | His | Trp | Pro | Trp | His | Glu | Leu | Thr | Glu | Gln | Ser | Phe | Ala | Val | Leu | 260 | 265 | 270 |
| Leu | Gln | Asn | Phe | Gly | Asn | Trp | Tyr | Glu | Gln | His | Ser | Ala | Pro | Glu | Ser | 275 | 280 | 285 |
| Thr | Gln | Leu | Gly | Leu | Phe | Ser | Thr | Leu | Val | Cys | Ala | His | Arg | Gln | Ala | 290 | 295 | 300 |
| Gly | Tyr | Val | Thr | Leu | Asn | Val | His | Leu | Asp | Gly | Thr | Asp | Pro | Asn | Ala | 305 | 310 | 315 |
| Glu | Arg | Thr | Leu | Ala | Glu | His | Leu | Ser | Ala | Ile | Asn | Ala | Gln | Val | Gly | 325 | 330 | 335 |

Val Thr Pro Ala Glu Gly Leu Arg Glu Thr Leu Pro Trp Leu Arg Ser
 340 345 350
 Thr Gln Val Ala Gly Ala Ile Ala Glu Gly Gly Glu Pro Gly Met Gln
 355 360 365
 Arg Thr Lys Val Lys Ala Ala Tyr Leu Arg Thr Gly Leu Ser Glu Ala
 370 375 380
 Gln Leu Ala Thr Val Tyr Arg Arg Leu Thr Val Tyr Gly Tyr Asp Asn
 385 390 395 400
 Pro Ala Ala Ala Leu Leu Leu Leu Gly Tyr Gly Gly Met Ala Asn Ala
 405 410 415
 Val Ala Pro Ser Ala Thr Ala Leu Ala Gln Arg Asp Ser Val Leu Lys
 420 425 430
 Ala Leu Phe Val Thr Asn Trp Ser Glu Pro Ala Glu Asp Glu Arg His
 435 440 445
 Leu Thr Trp Ile Arg Gly Phe Tyr Arg Glu Met Tyr Ala Glu Thr Gly
 450 455 460
 Gly Val Pro Val Pro Gly Thr Arg Val Asp Gly Ser Tyr Ile Asn Tyr
 465 470 475 480
 Pro Asp Thr Asp Leu Ala Asp Pro Leu Trp Asn Thr Ser Gly Val Ala
 485 490 495
 Trp His Asp Leu Tyr Tyr Lys Asp Asn Tyr Pro Arg Leu Gln Arg Ala
 500 505 510
 Lys Ala Arg Trp Asp Pro Gln Asn Ile Phe Gln His Gly Leu Ser Ile
 515 520 525
 Lys Pro Pro Ala Arg Leu Ser Pro Gly Gln Pro
 530 535

<210> 17
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 <213> Saccharopolyspora spinosa

<220>
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 <222> (1)..(1191)
 <223> ORF6; methyltransferase

<400> 17
 atg tcc aca acg cac gag atc gaa acc gtg gaa cgc atc atc ctc gcc 48
 Met Ser Thr Thr His Glu Ile Glu Thr Val Glu Arg Ile Ile Leu Ala
 1 5 10 15

| | |
|-----------------------------------------------------------------|-----|
| gcc gga tcc agt gcg gcg agc ctg gcc gac ctg acc acc gaa ctc gga | 96 |
| Ala Gly Ser Ser Ala Ala Ser Leu Ala Asp Leu Thr Thr Glu Leu Gly | |
| 20 25 30 | |
| ctc gcc agg atc gca ccc gtg ctg atc gac gag atc ctc ttc cgc gcg | 144 |
| Leu Ala Arg Ile Ala Pro Val Leu Ile Asp Glu Ile Leu Phe Arg Ala | |
| 35 40 45 | |
| gaa ccg gcc ccc gac atc gaa cgg acc gag gtc gcg gtc cag atc acc | 192 |
| Glu Pro Ala Pro Asp Ile Glu Arg Thr Glu Val Ala Val Gln Ile Thr | |
| 50 55 60 | |
| cac cga ggc gag acc gtt gac ttc gtc ctg acg cta cag tcc ggt gag | 240 |
| His Arg Gly Glu Thr Val Asp Phe Val Leu Thr Leu Gln Ser Gly Glu | |
| 65 70 75 80 | |
| ctg atc aag gcc gag caa cga ccg gtc gga gac gtc ccg ctg cgg atc | 288 |
| Leu Ile Lys Ala Glu Gln Arg Pro Val Gly Asp Val Pro Leu Arg Ile | |
| 85 90 95 | |
| ggt tac gag ctc acc gat ctc atc gcc gag ttg ttc ggc cca gga gct | 336 |
| Gly Tyr Glu Leu Thr Asp Leu Ile Ala Glu Leu Phe Gly Pro Gly Ala | |
| 100 105 110 | |
| ccc agg gcc gtc ggc gcc cgg agc acc aac ttc ctc cga acc acc aca | 384 |
| Pro Arg Ala Val Gly Ala Arg Ser Thr Asn Phe Leu Arg Thr Thr Thr | |
| 115 120 125 | |
| tcc ggt tcg ata ccc ggt ccg tcg gaa ctg tcc gat ggc ttc cag gcc | 432 |
| Ser Gly Ser Ile Pro Gly Pro Ser Glu Leu Ser Asp Gly Phe Gln Ala | |
| 130 135 140 | |
| atc tcc gca gtg gtc gcc ggc tgc ggg cac cga cgt ccc gac ctc aac | 480 |
| Ile Ser Ala Val Val Ala Gly Cys Gly His Arg Arg Pro Asp Leu Asn | |
| 145 150 155 160 | |
| ttg ctc gcc tcc cac tac cgc acg gac aag tgg ggc ggc ctg cac tgg | 528 |
| Leu Leu Ala Ser His Tyr Arg Thr Asp Lys Trp Gly Gly Leu His Trp | |
| 165 170 175 | |
| ttc acc ccg cta tac gag cga cac ctc ggc gag ttc cgt gat cgc ccg | 576 |
| Phe Thr Pro Leu Tyr Glu Arg His Leu Gly Glu Phe Arg Asp Arg Pro | |
| 180 185 190 | |
| gtg cgc atc ctg gag atc ggt gtc ggt ggc tac aac ttc gac ggt ggc | 624 |
| Val Arg Ile Leu Glu Ile Gly Val Gly Gly Tyr Asn Phe Asp Gly Gly | |
| 195 200 205 | |
| ggc ggc gaa tcc ctg aag atg tgg aag cgc tac ttc cac cgc ggc ctc | 672 |
| Gly Gly Glu Ser Leu Lys Met Trp Lys Arg Tyr Phe His Arg Gly Leu | |
| 210 215 220 | |
| gtg ttc ggg atg gac gtt ttc gac aag tcc ttc ctc gac cag cag agg | 720 |
| Val Phe Gly Met Asp Val Phe Asp Lys Ser Phe Leu Asp Gln Gln Arg | |
| 225 230 235 240 | |
| ctc tgc acc gtc cgc gcc gac cag agc aag ccc gag gag ctg gcc gcc | 768 |

| | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Leu | Cys | Thr | Val | Arg | Ala | Asp | Gln | Ser | Lys | Pro | Glu | Glu | Leu | Ala | Ala | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | | |
| gtt | gac | gac | aag | tac | gga | ccg | ttc | gac | atc | atc | atc | gac | gat | ggc | agc | 816 | |
| Val | Asp | Asp | Lys | Tyr | Gly | Pro | Phe | Asp | Ile | Ile | Ile | Asp | Asp | Gly | Ser | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | |
| cac | atc | aac | gga | cac | gtg | cgc | aca | tcc | ctg | gaa | acg | ctg | ttc | ccc | cgg | 864 | |
| His | Ile | Asn | Gly | His | Val | Arg | Thr | Ser | Leu | Glu | Thr | Leu | Phe | Pro | Arg | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | |
| ttg | cgc | agc | ggc | gta | tac | gtg | atc | gag | gat | ctg | tgg | acg | acc | tat | | 912 | |
| Leu | Arg | Ser | Gly | Gly | Val | Tyr | Val | Ile | Glu | Asp | Leu | Trp | Thr | Thr | Tyr | | |
| | 290 | | | | | 295 | | | | 300 | | | | | | | |
| gct | ccc | gga | ttc | ggc | ggg | cag | gcg | cag | tgc | ccg | gcc | gca | ccc | ggc | acc | 960 | |
| Ala | Pro | Gly | Phe | Gly | Gly | Gln | Ala | Gln | Cys | Pro | Ala | Ala | Pro | Gly | Thr | | |
| 305 | | | | | 310 | | | | 315 | | | | | 320 | | | |
| acg | gtc | agc | ctg | ctc | aag | aac | ctg | ttg | gaa | ggc | gtt | cag | cac | gag | gag | 1008 | |
| Thr | Val | Ser | Leu | Leu | Lys | Asn | Leu | Leu | Glu | Gly | Val | Gln | His | Glu | Glu | | |
| | | | 325 | | | | | 330 | | | | | 335 | | | | |
| cag | ccg | cat | gcg | ggc | tcg | tac | gag | ccg | agc | tac | ctg | gaa | cgc | aat | ttg | 1056 | |
| Gln | Pro | His | Ala | Gly | Ser | Tyr | Glu | Pro | Ser | Tyr | Leu | Glu | Arg | Asn | Leu | | |
| | | | 340 | | | | | 345 | | | | | 350 | | | | |
| gtc | ggc | ctc | cac | acc | tac | cac | aac | atc | gcg | ttc | ctg | gag | aaa | ggc | gtc | 1104 | |
| Val | Gly | Leu | His | Thr | Tyr | His | Asn | Ile | Ala | Phe | Leu | Glu | Lys | Gly | Val | | |
| | | 355 | | | | | 360 | | | | | 365 | | | | | |
| aac | gcc | gaa | ggc | ggc | gtt | cct | gct | tgg | gtg | cca | agg | agt | ctg | gac | gac | 1152 | |
| Asn | Ala | Glu | Gly | Gly | Val | Pro | Ala | Trp | Val | Pro | Arg | Ser | Leu | Asp | Asp | | |
| | 370 | | | | | 375 | | | | 380 | | | | | | | |
| ata | ttg | cac | ctg | gcc | gac | gtg | aac | agc | gcg | gag | gac | gag | tga | | | 1194 | |
| Ile | Leu | His | Leu | Ala | Asp | Val | Asn | Ser | Ala | Glu | Asp | Glu | | | | | |
| 385 | | | | | 390 | | | | 395 | | | | | | | | |

<210> 18
 <211> 397
 <212> PRT
 <213> Saccharopolyspora spinosa

<400> 18
 Met Ser Thr Thr His Glu Ile Glu Thr Val Glu Arg Ile Ile Leu Ala
 1 5 10 15
 Ala Gly Ser Ser Ala Ala Ser Leu Ala Asp Leu Thr Thr Glu Leu Gly
 20 25 30
 Leu Ala Arg Ile Ala Pro Val Leu Ile Asp Glu Ile Leu Phe Arg Ala
 35 40 45
 Glu Pro Ala Pro Asp Ile Glu Arg Thr Glu Val Ala Val Gln Ile Thr
 50 55 60

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Arg | Gly | Glu | Thr | Val | Asp | Phe | Val | Leu | Thr | Leu | Gln | Ser | Gly | Glu | 65 | 70 | 75 | 80 |
| Leu | Ile | Lys | Ala | Glu | Gln | Arg | Pro | Val | Gly | Asp | Val | Pro | Leu | Arg | Ile | 85 | 90 | 95 | |
| Gly | Tyr | Glu | Leu | Thr | Asp | Leu | Ile | Ala | Glu | Leu | Phe | Gly | Pro | Gly | Ala | 100 | 105 | 110 | |
| Pro | Arg | Ala | Val | Gly | Ala | Arg | Ser | Thr | Asn | Phe | Leu | Arg | Thr | Thr | Thr | 115 | 120 | 125 | |
| Ser | Gly | Ser | Ile | Pro | Gly | Pro | Ser | Glu | Leu | Ser | Asp | Gly | Phe | Gln | Ala | 130 | 135 | 140 | |
| Ile | Ser | Ala | Val | Val | Ala | Gly | Cys | Gly | His | Arg | Arg | Pro | Asp | Leu | Asn | 145 | 150 | 155 | 160 |
| Leu | Leu | Ala | Ser | His | Tyr | Arg | Thr | Asp | Lys | Trp | Gly | Gly | Leu | His | Trp | 165 | 170 | 175 | |
| Phe | Thr | Pro | Leu | Tyr | Glu | Arg | His | Leu | Gly | Glu | Phe | Arg | Asp | Arg | Pro | 180 | 185 | 190 | |
| Val | Arg | Ile | Leu | Glu | Ile | Gly | Val | Gly | Gly | Tyr | Asn | Phe | Asp | Gly | Gly | 195 | 200 | 205 | |
| Gly | Gly | Glu | Ser | Leu | Lys | Met | Trp | Lys | Arg | Tyr | Phe | His | Arg | Gly | Leu | 210 | 215 | 220 | |
| Val | Phe | Gly | Met | Asp | Val | Phe | Asp | Lys | Ser | Phe | Leu | Asp | Gln | Gln | Arg | 225 | 230 | 235 | 240 |
| Leu | Cys | Thr | Val | Arg | Ala | Asp | Gln | Ser | Lys | Pro | Glu | Glu | Leu | Ala | Ala | 245 | 250 | 255 | |
| Val | Asp | Asp | Lys | Tyr | Gly | Pro | Phe | Asp | Ile | Ile | Ile | Asp | Asp | Gly | Ser | 260 | 265 | 270 | |
| His | Ile | Asn | Gly | His | Val | Arg | Thr | Ser | Leu | Glu | Thr | Leu | Phe | Pro | Arg | 275 | 280 | 285 | |
| Leu | Arg | Ser | Gly | Gly | Val | Tyr | Val | Ile | Glu | Asp | Leu | Trp | Thr | Thr | Tyr | 290 | 295 | 300 | |
| Ala | Pro | Gly | Phe | Gly | Gly | Gln | Ala | Gln | Cys | Pro | Ala | Ala | Pro | Gly | Thr | 305 | 310 | 315 | 320 |
| Thr | Val | Ser | Leu | Leu | Lys | Asn | Leu | Leu | Glu | Gly | Val | Gln | His | Glu | Glu | 325 | 330 | 335 | |
| Gln | Pro | His | Ala | Gly | Ser | Tyr | Glu | Pro | Ser | Tyr | Leu | Glu | Arg | Asn | Leu | 340 | 345 | 350 | |
| Val | Gly | Leu | His | Thr | Tyr | His | Asn | Ile | Ala | Phe | Leu | Glu | Lys | Gly | Val | 355 | 360 | 365 | |

Asn Ala Glu Gly Gly Val Pro Ala Trp Val Pro Arg Ser Leu Asp Asp
 370 375 380

Ile Leu His Leu Ala Asp Val Asn Ser Ala Glu Asp Glu
 385 390 395

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 <213> Saccharopolyspora spinosa

<220>
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 <222> (1)..(897)
 <223> ORF7; O-methyltransferase

<400> 19
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 gtg gag tcc atc ttc gat gcg ttg gcg cac ggg cgt ccc ctg cac cac 96
 Val Glu Ser Ile Phe Asp Ala Leu Ala His Gly Arg Pro Leu His His
 20 25 30
 ggt tac tgg gcg ggc ggg tat cgg gag gat gcc ggt gcc aca ccg tgg 144
 Gly Tyr Trp Ala Gly Gly Tyr Arg Glu Asp Ala Gly Ala Thr Pro Trp
 35 40 45
 tcg gat gct gcc gac caa ctg acc gac ctg ttc atc gac aag gcc gcg 192
 Ser Asp Ala Ala Asp Gln Leu Thr Asp Leu Phe Ile Asp Lys Ala Ala
 50 55 60
 ctc cgt ccc gga gcg cac ctg ttc gac ctg ggc tgc ggc aat ggg cag 240
 Leu Arg Pro Gly Ala His Leu Phe Asp Leu Gly Cys Gly Asn Gly Gln
 65 70 75 80
 ccc gta gtc cgt gcg gca tgc gcc agc ggc gtt cga gtc acc gga atc 288
 Pro Val Val Arg Ala Ala Cys Ala Ser Gly Val Arg Val Thr Gly Ile
 85 90 95
 acc gtg aac gcc cag cat ctc gcc gcc gcc acc agg ctc gcc aac gag 336
 Thr Val Asn Ala Gln His Leu Ala Ala Ala Thr Arg Leu Ala Asn Glu
 100 105 110
 acc gga ctg gcc ggc agt ctt gag ttc gat cta gtc gac ggc gcc cag 384
 Thr Gly Leu Ala Gly Ser Leu Glu Phe Asp Leu Val Asp Gly Ala Gln
 115 120 125
 ctg ccc tac ccg gac ggt ttc ttt cag gcc gca tgg gcg atg cag tcc 432
 Leu Pro Tyr Pro Asp Gly Phe Phe Gln Ala Ala Trp Ala Met Gln Ser
 130 135 140
 gtc gtg cag atc gtg gac cag gcc gcc gcg atc cgc gag gtc cac cga 480

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Val | Gln | Ile | Val | Asp | Gln | Ala | Ala | Ala | Ile | Arg | Glu | Val | His | Arg | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| atc | ctg | gaa | ccc | ggc | ggc | cgg | ttc | gtc | ctc | gga | gac | atc | atc | act | cgg | 528 |
| Ile | Leu | Glu | Pro | Gly | Gly | Arg | Phe | Val | Leu | Gly | Asp | Ile | Ile | Thr | Arg | |
| | | | | 165 | | | | | 170 | | | | | 175 | | |
| gtt | cga | ctc | ccg | gaa | gag | tac | gcg | gcg | gtt | tgg | acg | ggc | acg | acc | gcc | 576 |
| Val | Arg | Leu | Pro | Glu | Glu | Tyr | Ala | Ala | Val | Trp | Thr | Gly | Thr | Thr | Ala | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| cat | acc | ttg | aac | agc | ttc | acg | gcg | ctg | gtc | agc | gaa | gcc | ggg | ttc | gag | 624 |
| His | Thr | Leu | Asn | Ser | Phe | Thr | Ala | Leu | Val | Ser | Glu | Ala | Gly | Phe | Glu | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| att | ctc | gaa | gtc | acc | gac | ctc | acg | gca | cag | acc | agg | tgc | atg | gtc | tcc | 672 |
| Ile | Leu | Glu | Val | Thr | Asp | Leu | Thr | Ala | Gln | Thr | Arg | Cys | Met | Val | Ser | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| tgg | tac | gtc | gac | gag | ttg | ctc | cgg | aaa | ctc | gat | gag | ctc | gcc | ggc | gtc | 720 |
| Trp | Tyr | Val | Asp | Glu | Leu | Leu | Arg | Lys | Leu | Asp | Glu | Leu | Ala | Gly | Val | |
| 225 | | | | 230 | | | | | | 235 | | | | 240 | | |
| gag | cct | gcg | gct | gtc | ggc | acc | tac | cag | caa | cgc | tac | ttg | gga | gac | atc | 768 |
| Glu | Pro | Ala | Ala | Val | Gly | Thr | Tyr | Gln | Gln | Arg | Tyr | Leu | Gly | Asp | Ile | |
| | | | | 245 | | | | | 250 | | | | | 255 | | |
| gcg | gcg | aag | cac | gga | ccg | gga | cca | gca | cag | ctg | atc | gcc | gcg | gtt | gcg | 816 |
| Ala | Ala | Lys | His | Gly | Pro | Gly | Pro | Ala | Gln | Leu | Ile | Ala | Ala | Val | Ala | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| gaa | tac | cgg | aaa | cat | ccg | gat | tac | gcc | aga | aac | gag | gaa | agc | atg | ggc | 864 |
| Glu | Tyr | Arg | Lys | His | Pro | Asp | Tyr | Ala | Arg | Asn | Glu | Glu | Ser | Met | Gly | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| ttc | atg | ctc | ctg | cag | gct | cga | aag | aag | cag | tcc | tga | | | | | 900 |
| Phe | Met | Leu | Leu | Gln | Ala | Arg | Lys | Lys | Gln | Ser | | | | | | |
| | 290 | | | | | 295 | | | | | | | | | | |

<210> 20

<211> 299

<212> PRT

<213> Saccharopolyspora spinosa

<400> 20

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Val | Asn | Ser | Arg | Gly | Ala | Asn | Thr | Gln | Ala | Phe | Pro | Thr | Ala | Asp | Gln | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| Val | Glu | Ser | Ile | Phe | Asp | Ala | Leu | Ala | His | Gly | Arg | Pro | Leu | His | His | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Gly | Tyr | Trp | Ala | Gly | Gly | Tyr | Arg | Glu | Asp | Ala | Gly | Ala | Thr | Pro | Trp | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Ser | Asp | Ala | Ala | Asp | Gln | Leu | Thr | Asp | Leu | Phe | Ile | Asp | Lys | Ala | Ala | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Arg | Pro | Gly | Ala | His | Leu | Phe | Asp | Leu | Gly | Cys | Gly | Asn | Gly | Gln | 65 | 70 | 75 | 80 |
| Pro | Val | Val | Arg | Ala | Ala | Cys | Ala | Ser | Gly | Val | Arg | Val | Thr | Gly | Ile | 85 | 90 | 95 | |
| Thr | Val | Asn | Ala | Gln | His | Leu | Ala | Ala | Ala | Thr | Arg | Leu | Ala | Asn | Glu | 100 | 105 | 110 | |
| Thr | Gly | Leu | Ala | Gly | Ser | Leu | Glu | Phe | Asp | Leu | Val | Asp | Gly | Ala | Gln | 115 | 120 | 125 | |
| Leu | Pro | Tyr | Pro | Asp | Gly | Phe | Phe | Gln | Ala | Ala | Trp | Ala | Met | Gln | Ser | 130 | 135 | 140 | |
| Val | Val | Gln | Ile | Val | Asp | Gln | Ala | Ala | Ala | Ile | Arg | Glu | Val | His | Arg | 145 | 150 | 155 | 160 |
| Ile | Leu | Glu | Pro | Gly | Gly | Arg | Phe | Val | Leu | Gly | Asp | Ile | Ile | Thr | Arg | 165 | 170 | 175 | |
| Val | Arg | Leu | Pro | Glu | Glu | Tyr | Ala | Ala | Val | Trp | Thr | Gly | Thr | Thr | Ala | 180 | 185 | 190 | |
| His | Thr | Leu | Asn | Ser | Phe | Thr | Ala | Leu | Val | Ser | Glu | Ala | Gly | Phe | Glu | 195 | 200 | 205 | |
| Ile | Leu | Glu | Val | Thr | Asp | Leu | Thr | Ala | Gln | Thr | Arg | Cys | Met | Val | Ser | 210 | 215 | 220 | |
| Trp | Tyr | Val | Asp | Glu | Leu | Leu | Arg | Lys | Leu | Asp | Glu | Leu | Ala | Gly | Val | 225 | 230 | 235 | 240 |
| Glu | Pro | Ala | Ala | Val | Gly | Thr | Tyr | Gln | Gln | Arg | Tyr | Leu | Gly | Asp | Ile | 245 | 250 | 255 | |
| Ala | Ala | Lys | His | Gly | Pro | Gly | Pro | Ala | Gln | Leu | Ile | Ala | Ala | Val | Ala | 260 | 265 | 270 | |
| Glu | Tyr | Arg | Lys | His | Pro | Asp | Tyr | Ala | Arg | Asn | Glu | Glu | Ser | Met | Gly | 275 | 280 | 285 | |
| Phe | Met | Leu | Leu | Gln | Ala | Arg | Lys | Lys | Gln | Ser | | | | | | 290 | 295 | | |

<210> 21
 <211> 1167
 <212> DNA
 <213> Saccharopolyspora spinosa

 <220>
 <221> CDS
 <222> (1)..(1164)
 <223> ORF8; cyclization enzyme

<400> 21

| | |
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| atg gcc tcc gag cac gcc agc ctg gtc ggc gac gat ctg cgg gca ccc | 48 |
| Met Ala Ser Glu His Ala Ser Leu Val Gly Asp Asp Leu Arg Ala Pro | |
| 1 5 10 15 | |
| gcg gat gat ccc ttc tac cga ccg ccg acg ccg cta ccg ccg ggt gtc | 96 |
| Ala Asp Asp Pro Phe Tyr Arg Pro Pro Thr Pro Leu Pro Pro Gly Val | |
| 20 25 30 | |
| ccg ggc acg ctc ctc agg gcc ccg ccc gtc tcg gca ctg cgc ggc acg | 144 |
| Pro Gly Thr Leu Leu Arg Ala Arg Pro Val Ser Ala Leu Arg Gly Thr | |
| 35 40 45 | |
| ggc gaa ccc gtc gca gcc aag gcc tgg caa atc ctc tac cgg tcc aac | 192 |
| Gly Glu Pro Val Ala Ala Lys Ala Trp Gln Ile Leu Tyr Arg Ser Asn | |
| 50 55 60 | |
| tcc gcc ctt ggc atg ccg aac gcc gtc tcc ggc acc gtt ctg gtg ccg | 240 |
| Ser Ala Leu Gly Met Pro Asn Ala Val Ser Gly Thr Val Leu Val Pro | |
| 65 70 75 80 | |
| aac atc ccg tgg ccg cgc gaa gat cgc ccc atc atc act ttc gca gtg | 288 |
| Asn Ile Pro Trp Pro Arg Glu Asp Arg Pro Ile Ile Thr Phe Ala Val | |
| 85 90 95 | |
| ggc acc cac ggc ctc ggt agc caa gtt gcc ccg tcg tac ctg ctt cga | 336 |
| Gly Thr His Gly Leu Gly Ser Gln Val Ala Pro Ser Tyr Leu Leu Arg | |
| 100 105 110 | |
| acc gga acc gag ccg gag acc gag ctg atc gcc gtg gcc ctc gac cgc | 384 |
| Thr Gly Thr Glu Pro Glu Thr Glu Leu Ile Ala Val Ala Leu Asp Arg | |
| 115 120 125 | |
| ggg tgg gcc gtg gtc atc acc gac tac gaa ggc ctc ggt act cct gga | 432 |
| Gly Trp Ala Val Val Ile Thr Asp Tyr Glu Gly Leu Gly Thr Pro Gly | |
| 130 135 140 | |
| acc cac acc tac acc gtc ggc agg gcg cag gga cac gcc atg ctc gat | 480 |
| Thr His Thr Tyr Thr Val Gly Arg Ala Gln Gly His Ala Met Leu Asp | |
| 145 150 155 160 | |
| gcc gcc cgc gct gcg caa ccg cta ccg ggc tcc ggc ctg acg acc gac | 528 |
| Ala Ala Arg Ala Ala Gln Arg Leu Pro Gly Ser Gly Leu Thr Thr Asp | |
| 165 170 175 | |
| tgc ccg gtc ggc atc tgg ggc tat gcg cag ggt ggg caa gcg tcg gcc | 576 |
| Cys Pro Val Gly Ile Trp Gly Tyr Ala Gln Gly Gly Gln Ala Ser Ala | |
| 180 185 190 | |
| ttc gcc ggc gaa ctg cac ccc acc tac gca cct gaa ctg cga atc cgc | 624 |
| Phe Ala Gly Glu Leu His Pro Thr Tyr Ala Pro Glu Leu Arg Ile Arg | |
| 195 200 205 | |
| gct gcg gcc gca ggt gcg gtg ccg atc gat ctg ctg gac atc atc cac | 672 |
| Ala Ala Ala Ala Gly Ala Val Pro Ile Asp Leu Leu Asp Ile Ile His | |
| 210 215 220 | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Gly | Thr | Leu | Leu | Arg | Ala | Arg | Pro | Val | Ser | Ala | Leu | Arg | Gly | Thr | 35 | 40 | 45 | |
| Gly | Glu | Pro | Val | Ala | Ala | Lys | Ala | Trp | Gln | Ile | Leu | Tyr | Arg | Ser | Asn | 50 | 55 | 60 | |
| Ser | Ala | Leu | Gly | Met | Pro | Asn | Ala | Val | Ser | Gly | Thr | Val | Leu | Val | Pro | 65 | 70 | 75 | 80 |
| Asn | Ile | Pro | Trp | Pro | Arg | Glu | Asp | Arg | Pro | Ile | Ile | Thr | Phe | Ala | Val | 85 | 90 | 95 | |
| Gly | Thr | His | Gly | Leu | Gly | Ser | Gln | Val | Ala | Pro | Ser | Tyr | Leu | Leu | Arg | 100 | 105 | 110 | |
| Thr | Gly | Thr | Glu | Pro | Glu | Thr | Glu | Leu | Ile | Ala | Val | Ala | Leu | Asp | Arg | 115 | 120 | 125 | |
| Gly | Trp | Ala | Val | Val | Ile | Thr | Asp | Tyr | Glu | Gly | Leu | Gly | Thr | Pro | Gly | 130 | 135 | 140 | |
| Thr | His | Thr | Tyr | Thr | Val | Gly | Arg | Ala | Gln | Gly | His | Ala | Met | Leu | Asp | 145 | 150 | 155 | 160 |
| Ala | Ala | Arg | Ala | Ala | Gln | Arg | Leu | Pro | Gly | Ser | Gly | Leu | Thr | Thr | Asp | 165 | 170 | 175 | |
| Cys | Pro | Val | Gly | Ile | Trp | Gly | Tyr | Ala | Gln | Gly | Gly | Gln | Ala | Ser | Ala | 180 | 185 | 190 | |
| Phe | Ala | Gly | Glu | Leu | His | Pro | Thr | Tyr | Ala | Pro | Glu | Leu | Arg | Ile | Arg | 195 | 200 | 205 | |
| Ala | Ala | Ala | Ala | Gly | Ala | Val | Pro | Ile | Asp | Leu | Leu | Asp | Ile | Ile | His | 210 | 215 | 220 | |
| Arg | Asn | Asp | Gly | Val | Phe | Thr | Gly | Pro | Val | Leu | Ala | Gly | Leu | Val | Gly | 225 | 230 | 235 | 240 |
| His | Ala | Ala | Ala | Tyr | Pro | Asp | Leu | Pro | Phe | Asp | Glu | Leu | Leu | Thr | Glu | 245 | 250 | 255 | |
| Ala | Gly | Arg | Thr | Ala | Val | Asp | Gln | Val | Arg | Glu | Leu | Gly | Ala | Pro | Glu | 260 | 265 | 270 | |
| Leu | Val | Thr | Arg | Phe | Leu | Gly | Arg | Glu | Leu | Ser | Asp | Phe | Leu | Asp | Thr | 275 | 280 | 285 | |
| Ser | Gly | Leu | Phe | Glu | Gln | Pro | Arg | Trp | Arg | Ala | Arg | Leu | Ala | Glu | Ser | 290 | 295 | 300 | |
| Val | Ala | Gly | Arg | Asn | Gly | Gly | Pro | Val | Val | Pro | Thr | Leu | Val | Tyr | His | 305 | 310 | 315 | 320 |
| Ser | Thr | Asp | Asp | Glu | Ile | Val | Pro | Phe | Ala | Phe | Gly | Glu | Arg | Leu | Arg | 325 | 330 | 335 | |

Asp Ser Tyr Arg Ala Ala Gly Thr Pro Val Arg Trp His Pro Leu Ser
 340 345 350
 Gly Leu Ala His Phe Pro Ala Ala Leu Ala Ser Ser Arg Val Val Val
 355 360 365
 Ser Trp Phe Asp Glu His Phe Ser Glu Pro Ser Ala Ile Ser Gly Pro
 370 375 380
 Arg Asp Ala Arg
 385

<210> 23
 <211> 1011
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(1008)
 <223> ORF9; 2,3-reductase

<400> 23
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 Met Thr Ser Ser Met Arg Lys Pro Val Arg Ile Gly Val Leu Gly Cys
 1 5 10 15
 gct tcc ttc gcg tgg cga cgg atg ctg ccc gcg atg tgc gac gtg gcc 96
 Ala Ser Phe Ala Trp Arg Arg Met Leu Pro Ala Met Cys Asp Val Ala
 20 25 30
 gaa aca gag gtg gtg gcg gtg gcg agc cgt gat ccg gcg aaa gcc gaa 144
 Glu Thr Glu Val Val Ala Val Ala Ser Arg Asp Pro Ala Lys Ala Glu
 35 40 45
 cgg ttc gca gcg cga ttc gaa tgc gag gcg gtg ctg ggt tac cag cgg 192
 Arg Phe Ala Ala Arg Phe Glu Cys Glu Ala Val Leu Gly Tyr Gln Arg
 50 55 60
 ctc ctg gag cgg ccg gac atc gat gcc gtc tac gtg ccg ttg ccg cct 240
 Leu Leu Glu Arg Pro Asp Ile Asp Ala Val Tyr Val Pro Leu Pro Pro
 65 70 75 80
 ggc atg cat gca gag tgg atc ggc aag gcg ctt gag gca gac aaa cac 288
 Gly Met His Ala Glu Trp Ile Gly Lys Ala Leu Glu Ala Asp Lys His
 85 90 95
 gtg ctt gcg gag aaa ccg ctg acg acg acg gcg tcc gac acc gct cgc 336
 Val Leu Ala Glu Lys Pro Leu Thr Thr Thr Ala Ser Asp Thr Ala Arg
 100 105 110
 ctg gtc ggg ctg gcc agg agg aag aac ctg ctg ctg cgg gag aat tac 384
 Leu Val Gly Leu Ala Arg Arg Lys Asn Leu Leu Leu Arg Glu Asn Tyr
 115 120 125

| | |
|---------------------------------------------------------------------|------|
| ctg ttc ctc cac cac ggc cgg cac gac gtg gtc cgc gac ctg ctg caa | 432 |
| Leu Phe Leu Leu His His Gly Arg His Asp Val Val Arg Asp Leu Leu Gln | |
| 130 135 140 | |
| tcc ggg gag atc ggt gag ctc cgg gag ttc acc gcc gtg ttc gga att | 480 |
| Ser Gly Glu Ile Gly Glu Leu Arg Glu Phe Thr Ala Val Phe Gly Ile | |
| 145 150 155 160 | |
| ccg ccg ctt ccc gac acg gac atc cgc tat cgc acc gaa ctc ggt ggc | 528 |
| Pro Pro Leu Pro Asp Thr Asp Ile Arg Tyr Arg Thr Glu Leu Gly Gly | |
| 165 170 175 | |
| gga gcg ttg ctg gac atc ggt gtc tat ccc gcc cgt gcc gct cgg cac | 576 |
| Gly Ala Leu Leu Asp Ile Gly Val Tyr Pro Ala Arg Ala Ala Arg His | |
| 180 185 190 | |
| ttt ctc ctc ggt ccg ctc acg gtt ctc ggc gca agc tcg cac gag gcc | 624 |
| Phe Leu Leu Gly Pro Leu Thr Val Leu Gly Ala Ser Ser His Glu Ala | |
| 195 200 205 | |
| cag gag tcg ggc gtc gac ttg tcg ggc agc gtg ctg ctc caa tcg gaa | 672 |
| Gln Glu Ser Gly Val Asp Leu Ser Gly Ser Val Leu Leu Gln Ser Glu | |
| 210 215 220 | |
| ggt ggc acc gtt gcc cac ctc gga tac ggt ttc gtg cac cac tac cgc | 720 |
| Gly Gly Thr Val Ala His Leu Gly Tyr Gly Phe Val His His Tyr Arg | |
| 225 230 235 240 | |
| agc gcg tac gag ctg tgg ggg agt cgt ggg cga atc gtc gtc gac cgg | 768 |
| Ser Ala Tyr Glu Leu Trp Gly Ser Arg Gly Arg Ile Val Val Asp Arg | |
| 245 250 255 | |
| gcg ttc acg ccg ccc gcc gag tgg cag gcc gtg atc cga atc gag cgg | 816 |
| Ala Phe Thr Pro Pro Ala Glu Trp Gln Ala Val Ile Arg Ile Glu Arg | |
| 260 265 270 | |
| aag ggc gtt gtc gac gag ttg tcc ttg cca gcg gaa gat cag gtt cgc | 864 |
| Lys Gly Val Val Asp Glu Leu Ser Leu Pro Ala Glu Asp Gln Val Arg | |
| 275 280 285 | |
| aag gcg gtc acc gcc ttc gca cgc gac atc aga gca ggg aca ggc gtg | 912 |
| Lys Ala Val Thr Ala Phe Ala Arg Asp Ile Arg Ala Gly Thr Gly Val | |
| 290 295 300 | |
| gac gac cct gcg gtg gcc gga gat tcg ggc gaa tcg atg atc cag cag | 960 |
| Asp Asp Pro Ala Val Ala Gly Asp Ser Gly Glu Ser Met Ile Gln Gln | |
| 305 310 315 320 | |
| gcc gcg ctg gtg gag gcg atc ggt cag gcc cgt cgg tgc ggg tcc aca | 1008 |
| Ala Ala Leu Val Glu Ala Ile Gly Gln Ala Arg Arg Cys Gly Ser Thr | |
| 325 330 335 | |
| tag | 1011 |

<211> 336

<212> PRT

<213> Saccharopolyspora spinosa

<400> 24

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Thr | Ser | Ser | Met | Arg | Lys | Pro | Val | Arg | Ile | Gly | Val | Leu | Gly | Cys |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ser | Phe | Ala | Trp | Arg | Arg | Met | Leu | Pro | Ala | Met | Cys | Asp | Val | Ala |
| | | | 20 | | | | | 25 | | | | | 30 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Thr | Glu | Val | Val | Ala | Val | Ala | Ser | Arg | Asp | Pro | Ala | Lys | Ala | Glu |
| | | 35 | | | | | 40 | | | | | | 45 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Phe | Ala | Ala | Arg | Phe | Glu | Cys | Glu | Ala | Val | Leu | Gly | Tyr | Gln | Arg |
| | 50 | | | | | 55 | | | | | 60 | | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Glu | Arg | Pro | Asp | Ile | Asp | Ala | Val | Tyr | Val | Pro | Leu | Pro | Pro |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Met | His | Ala | Glu | Trp | Ile | Gly | Lys | Ala | Leu | Glu | Ala | Asp | Lys | His |
| | | | | 85 | | | | | 90 | | | | | 95 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Leu | Ala | Glu | Lys | Pro | Leu | Thr | Thr | Thr | Ala | Ser | Asp | Thr | Ala | Arg |
| | | | 100 | | | | | 105 | | | | | 110 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Val | Gly | Leu | Ala | Arg | Arg | Lys | Asn | Leu | Leu | Leu | Arg | Glu | Asn | Tyr |
| | 115 | | | | | | 120 | | | | | 125 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Phe | Leu | His | His | Gly | Arg | His | Asp | Val | Val | Arg | Asp | Leu | Leu | Gln |
| | 130 | | | | | 135 | | | | | 140 | | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Gly | Glu | Ile | Gly | Glu | Leu | Arg | Glu | Phe | Thr | Ala | Val | Phe | Gly | Ile |
| 145 | | | | 150 | | | | | | 155 | | | | | 160 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Pro | Leu | Pro | Asp | Thr | Asp | Ile | Arg | Tyr | Arg | Thr | Glu | Leu | Gly | Gly |
| | | | | 165 | | | | | 170 | | | | | 175 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Ala | Leu | Leu | Asp | Ile | Gly | Val | Tyr | Pro | Ala | Arg | Ala | Ala | Arg | His |
| | | 180 | | | | | | 185 | | | | | 190 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Leu | Leu | Gly | Pro | Leu | Thr | Val | Leu | Gly | Ala | Ser | Ser | His | Glu | Ala |
| | 195 | | | | | | 200 | | | | | 205 | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Glu | Ser | Gly | Val | Asp | Leu | Ser | Gly | Ser | Val | Leu | Leu | Gln | Ser | Glu |
| | 210 | | | | | 215 | | | | | 220 | | | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Gly | Thr | Val | Ala | His | Leu | Gly | Tyr | Gly | Phe | Val | His | His | Tyr | Arg |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Ala | Tyr | Glu | Leu | Trp | Gly | Ser | Arg | Gly | Arg | Ile | Val | Val | Asp | Arg |
| | | | | 245 | | | | | 250 | | | | | 255 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Phe | Thr | Pro | Pro | Ala | Glu | Trp | Gln | Ala | Val | Ile | Arg | Ile | Glu | Arg |
| | | | 260 | | | | | 265 | | | | | 270 | | |

Lys Gly Val Val Asp Glu Leu Ser Leu Pro Ala Glu Asp Gln Val Arg

| | | |
|-----------------------------------------------------------------|-----|-----|
| 275 | 280 | 285 |
| Lys Ala Val Thr Ala Phe Ala Arg Asp Ile Arg Ala Gly Thr Gly Val | | |
| 290 | 295 | 300 |
| Asp Asp Pro Ala Val Ala Gly Asp Ser Gly Glu Ser Met Ile Gln Gln | | |
| 305 | 310 | 315 |
| Ala Ala Leu Val Glu Ala Ile Gly Gln Ala Arg Arg Cys Gly Ser Thr | | |
| 325 | 330 | 335 |

<210> 25
 <211> 1461
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(1458)
 <223> ORF10; 2,3-dehydratase

| | |
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| <400> 25 | |
| atg agc agt tct gtc gaa gct gag gca agt gct gct gcg ccg ctc ggc | 48 |
| Met Ser Ser Ser Val Glu Ala Glu Ala Ser Ala Ala Ala Pro Leu Gly | |
| 1 5 10 15 | |
| agc aac aac acg cgg cgg ttc gtc gac tct gcg ctg agc gct tgc aat | 96 |
| Ser Asn Asn Thr Arg Arg Phe Val Asp Ser Ala Leu Ser Ala Cys Asn | |
| 20 25 30 | |
| ggc atg att ccg acc acg gag ttc cac tgc tgg ctc gcc gat cgg ctg | 144 |
| Gly Met Ile Pro Thr Thr Glu Phe His Cys Trp Leu Ala Asp Arg Leu | |
| 35 40 45 | |
| ggc gag aac agc ttc gag acc aat cgc atc ccg ttc gac cgc ctg tcg | 192 |
| Gly Glu Asn Ser Phe Glu Thr Asn Arg Ile Pro Phe Asp Arg Leu Ser | |
| 50 55 60 | |
| aaa tgg aaa ttc gat gcc agc acg gag aac ctg gtt cat gcc gac ggt | 240 |
| Lys Trp Lys Phe Asp Ala Ser Thr Glu Asn Leu Val His Ala Asp Gly | |
| 65 70 75 80 | |
| agg ttc ttc acg gta gaa ggc ctg cag gtc gag acc aac tat ggc gcg | 288 |
| Arg Phe Phe Thr Val Glu Gly Leu Gln Val Glu Thr Asn Tyr Gly Ala | |
| 85 90 95 | |
| gca ccc agc tgg cac cag ccg atc atc aac cag gct gaa gta ggt atc | 336 |
| Ala Pro Ser Trp His Gln Pro Ile Ile Asn Gln Ala Glu Val Gly Ile | |
| 100 105 110 | |
| ctc ggc att ctc gtc aag gag atc gac ggc gtg ctg cac tgc ctc atg | 384 |
| Leu Gly Ile Leu Val Lys Glu Ile Asp Gly Val Leu His Cys Leu Met | |
| 115 120 125 | |
| tca gca aag atg gaa ccg ggc aac gtc aac gtc ctg cag ctc tcg ccg | 432 |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Ser | Ala | Lys | Met | Glu | Pro | Gly | Asn | Val | Asn | Val | Leu | Gln | Leu | Ser | Pro | |
| 130 | | | | | | 135 | | | | | 140 | | | | | |
| acg | gtt | cag | gca | act | cgg | agc | aac | tac | acg | cag | gca | cac | cgt | ggc | agc | 480 |
| Thr | Val | Gln | Ala | Thr | Arg | Ser | Asn | Tyr | Thr | Gln | Ala | His | Arg | Gly | Ser | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| gtt | ccg | ccc | tat | gtg | gac | tac | ttc | ctc | ggg | cgg | ggc | cgc | ggc | cgc | gtg | 528 |
| Val | Pro | Pro | Tyr | Val | Asp | Tyr | Phe | Leu | Gly | Arg | Gly | Arg | Gly | Arg | Val | |
| | | | | 165 | | | | | 170 | | | | | | 175 | |
| ctg | gta | gac | gtg | ctc | cag | tct | gaa | cag | ggg | tcc | tgg | ttc | tac | cgg | aag | 576 |
| Leu | Val | Asp | Val | Leu | Gln | Ser | Glu | Gln | Gly | Ser | Trp | Phe | Tyr | Arg | Lys | |
| | | | 180 | | | | | 185 | | | | | | 190 | | |
| cgc | aac | cgg | aac | atg | gtg | gtg | gaa | gtc | cag | gag | gaa | gtg | cca | gtc | ctg | 624 |
| Arg | Asn | Arg | Asn | Met | Val | Val | Glu | Val | Gln | Glu | Glu | Val | Pro | Val | Leu | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| cca | gac | ttc | tgc | tgg | ttg | acg | ctc | ggc | cag | gtg | ctg | gct | ctc | ctt | cgt | 672 |
| Pro | Asp | Phe | Cys | Trp | Leu | Thr | Leu | Gly | Gln | Val | Leu | Ala | Leu | Leu | Arg | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| cag | gac | aac | atc | gtc | aac | atg | gac | acc | cgg | acg | gtg | ctg | tct | tgc | atc | 720 |
| Gln | Asp | Asn | Ile | Val | Asn | Met | Asp | Thr | Arg | Thr | Val | Leu | Ser | Cys | Ile | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | |
| ccg | ttc | cac | gat | tcc | gcc | acc | gga | ccc | gaa | cta | gcc | gcc | tcg | gag | gag | 768 |
| Pro | Phe | His | Asp | Ser | Ala | Thr | Gly | Pro | Glu | Leu | Ala | Ala | Ser | Glu | Glu | |
| | | | | 245 | | | | | 250 | | | | | 255 | | |
| ccc | ttc | cga | cag | gcg | gtg | gcc | agg | tcg | ctc | tcg | cac | ggc | atc | gat | tcg | 816 |
| Pro | Phe | Arg | Gln | Ala | Val | Ala | Arg | Ser | Leu | Ser | His | Gly | Ile | Asp | Ser | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| tcg | agt | atc | tcc | gag | gcg | gtc | ggc | tgg | ttc | gag | gaa | gcc | aag | gcc | cgc | 864 |
| Ser | Ser | Ile | Ser | Glu | Ala | Val | Gly | Trp | Phe | Glu | Glu | Ala | Lys | Ala | Arg | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| tac | cgc | ttg | cgg | gca | acg | cgc | gtt | ccg | ctg | agc | agg | gtc | gac | aag | tgg | 912 |
| Tyr | Arg | Leu | Arg | Ala | Thr | Arg | Val | Pro | Leu | Ser | Arg | Val | Asp | Lys | Trp | |
| | | 290 | | | | 295 | | | | | 300 | | | | | |
| tat | cgc | acc | gat | acc | gag | atc | gcc | cac | cag | gac | ggc | aag | tac | ttc | gcg | 960 |
| Tyr | Arg | Thr | Asp | Thr | Glu | Ile | Ala | His | Gln | Asp | Gly | Lys | Tyr | Phe | Ala | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| gtg | atc | gcg | gtg | tcg | gtg | tcc | gcg | acc | aat | cgt | gag | gtc | gcc | agc | tgg | 1008 |
| Val | Ile | Ala | Val | Ser | Val | Ser | Ala | Thr | Asn | Arg | Glu | Val | Ala | Ser | Trp | |
| | | | | 325 | | | | | 330 | | | | 335 | | | |
| acg | cag | ccg | atg | atc | gaa | ccg | cga | gaa | caa | ggc | gag | atc | gca | ctg | ttg | 1056 |
| Thr | Gln | Pro | Met | Ile | Glu | Pro | Arg | Glu | Gln | Gly | Glu | Ile | Ala | Leu | Leu | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| gtc | aag | cgg | atc | ggc | gga | gtg | ctg | cac | ggc | ttg | gtc | cac | gct | cgg | gtg | 1104 |
| Val | Lys | Arg | Ile | Gly | Gly | Val | Leu | His | Gly | Leu | Val | His | Ala | Arg | Val | |

| 355 | 360 | 365 | |
|-----------------------------------------------------------------|-----|-----|------|
| gag gct ggg tat aag tgg act gcg gaa atc gct ccc acg gtc cag tgc | | | 1152 |
| Glu Ala Gly Tyr Lys Trp Thr Ala Glu Ile Ala Pro Thr Val Gln Cys | | | |
| 370 | 375 | 380 | |
| agt gtg gcc aac tac caa agc acc ccg tcg aac gac tgg ccg ccg ttc | | | 1200 |
| Ser Val Ala Asn Tyr Gln Ser Thr Pro Ser Asn Asp Trp Pro Pro Phe | | | |
| 385 | 390 | 395 | 400 |
| ttg gac gac gtg ctc acc gcc gat ccc gaa acc gtg cgg tac gaa tcg | | | 1248 |
| Leu Asp Asp Val Leu Thr Ala Asp Pro Glu Thr Val Arg Tyr Glu Ser | | | |
| | 405 | 410 | 415 |
| atc ctg tcc gaa gaa ggc ggt ccg ttc tac cag gcg cag aac agg tac | | | 1296 |
| Ile Leu Ser Glu Glu Gly Gly Arg Phe Tyr Gln Ala Gln Asn Arg Tyr | | | |
| | 420 | 425 | 430 |
| cgg atc atc gag gtg cat gag gac ttc gcg gca cga cct ccc agc gac | | | 1344 |
| Arg Ile Ile Glu Val His Glu Asp Phe Ala Ala Arg Pro Pro Ser Asp | | | |
| | 435 | 440 | 445 |
| ttc cgg tgg atg act ttg gga cag ttg ggc gag ctg ctc cgg agc acc | | | 1392 |
| Phe Arg Trp Met Thr Leu Gly Gln Leu Gly Glu Leu Leu Arg Ser Thr | | | |
| | 450 | 455 | 460 |
| cac ttc ttg aac atc cag gcg cgc agc ttg gtc gcc tcc ctg cat agc | | | 1440 |
| His Phe Leu Asn Ile Gln Ala Arg Ser Leu Val Ala Ser Leu His Ser | | | |
| | 465 | 470 | 475 |
| ttg tgg gcg ttg ggg cga tga | | | 1461 |
| Leu Trp Ala Leu Gly Arg | | | |
| | 485 | | |

<210> 26
 <211> 486
 <212> PRT
 <213> Saccharopolyspora spinosa

<400> 26
 Met Ser Ser Ser Val Glu Ala Glu Ala Ser Ala Ala Ala Pro Leu Gly
 1 5 10 15
 Ser Asn Asn Thr Arg Arg Phe Val Asp Ser Ala Leu Ser Ala Cys Asn
 20 25 30
 Gly Met Ile Pro Thr Thr Glu Phe His Cys Trp Leu Ala Asp Arg Leu
 35 40 45
 Gly Glu Asn Ser Phe Glu Thr Asn Arg Ile Pro Phe Asp Arg Leu Ser
 50 55 60
 Lys Trp Lys Phe Asp Ala Ser Thr Glu Asn Leu Val His Ala Asp Gly
 65 70 75 80
 Arg Phe Phe Thr Val Glu Gly Leu Gln Val Glu Thr Asn Tyr Gly Ala

| 85 | | | | | 90 | | | | | 95 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Pro | Ser | Trp | His | Gln | Pro | Ile | Ile | Asn | Gln | Ala | Glu | Val | Gly | Ile |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Leu | Gly | Ile | Leu | Val | Lys | Glu | Ile | Asp | Gly | Val | Leu | His | Cys | Leu | Met |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Ser | Ala | Lys | Met | Glu | Pro | Gly | Asn | Val | Asn | Val | Leu | Gln | Leu | Ser | Pro |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Thr | Val | Gln | Ala | Thr | Arg | Ser | Asn | Tyr | Thr | Gln | Ala | His | Arg | Gly | Ser |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Val | Pro | Pro | Tyr | Val | Asp | Tyr | Phe | Leu | Gly | Arg | Gly | Arg | Gly | Arg | Val |
| | | | | 165 | | | | | 170 | | | | | 175 | |
| Leu | Val | Asp | Val | Leu | Gln | Ser | Glu | Gln | Gly | Ser | Trp | Phe | Tyr | Arg | Lys |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Arg | Asn | Arg | Asn | Met | Val | Val | Glu | Val | Gln | Glu | Glu | Val | Pro | Val | Leu |
| | 195 | | | | | | 200 | | | | | 205 | | | |
| Pro | Asp | Phe | Cys | Trp | Leu | Thr | Leu | Gly | Gln | Val | Leu | Ala | Leu | Leu | Arg |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Gln | Asp | Asn | Ile | Val | Asn | Met | Asp | Thr | Arg | Thr | Val | Leu | Ser | Cys | Ile |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Pro | Phe | His | Asp | Ser | Ala | Thr | Gly | Pro | Glu | Leu | Ala | Ala | Ser | Glu | Glu |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Pro | Phe | Arg | Gln | Ala | Val | Ala | Arg | Ser | Leu | Ser | His | Gly | Ile | Asp | Ser |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Ser | Ser | Ile | Ser | Glu | Ala | Val | Gly | Trp | Phe | Glu | Glu | Ala | Lys | Ala | Arg |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Tyr | Arg | Leu | Arg | Ala | Thr | Arg | Val | Pro | Leu | Ser | Arg | Val | Asp | Lys | Trp |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Tyr | Arg | Thr | Asp | Thr | Glu | Ile | Ala | His | Gln | Asp | Gly | Lys | Tyr | Phe | Ala |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Val | Ile | Ala | Val | Ser | Val | Ser | Ala | Thr | Asn | Arg | Glu | Val | Ala | Ser | Trp |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Thr | Gln | Pro | Met | Ile | Glu | Pro | Arg | Glu | Gln | Gly | Glu | Ile | Ala | Leu | Leu |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Val | Lys | Arg | Ile | Gly | Gly | Val | Leu | His | Gly | Leu | Val | His | Ala | Arg | Val |
| | | 355 | | | | | 360 | | | | | 365 | | | |
| Glu | Ala | Gly | Tyr | Lys | Trp | Thr | Ala | Glu | Ile | Ala | Pro | Thr | Val | Gln | Cys |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Ser | Val | Ala | Asn | Tyr | Gln | Ser | Thr | Pro | Ser | Asn | Asp | Trp | Pro | Pro | Phe |

| | | | | | | |
|-----------------------------------------------------------------|-------------------------------------------------|-----|-----|-----|-----|-----|
| 385 | | 390 | | 395 | | 400 |
| Leu Asp Asp Val | Leu Thr Ala Asp Pro Glu Thr Val Arg Tyr Glu Ser | | | | | |
| | 405 | | 410 | | 415 | |
| Ile Leu Ser Glu Glu Gly Gly Arg Phe Tyr Gln Ala Gln Asn Arg Tyr | | | | | | |
| | 420 | | 425 | | 430 | |
| Arg Ile Ile Glu Val His Glu Asp Phe Ala Ala Arg Pro Pro Ser Asp | | | | | | |
| | 435 | | 440 | | 445 | |
| Phe Arg Trp Met Thr Leu Gly Gln Leu Gly Glu Leu Leu Arg Ser Thr | | | | | | |
| | 450 | | 455 | | 460 | |
| His Phe Leu Asn Ile Gln Ala Arg Ser Leu Val Ala Ser Leu His Ser | | | | | | |
| | 465 | | 470 | | 475 | 480 |
| Leu Trp Ala Leu Gly Arg | | | | | | |
| | 485 | | | | | |

<210> 27
 <211> 524
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(438)
 <223> ORF11; thioesterase

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| <400> 27 | |
| gtg agc aac gtg tgg ccg gaa aca tgg acg ccg ggg ttt ggc agg tgt | 48 |
| Val Ser Asn Val Trp Pro Glu Thr Trp Thr Pro Gly Phe Gly Arg Cys | |
| 1 5 10 15 | |
| tca tcg ctg ttg cgt cga ctc gga ttc cgc cgt gac cgg gac gat gcc | 96 |
| Ser Ser Leu Leu Arg Arg Leu Gly Phe Arg Arg Asp Arg Asp Ala | |
| 20 25 30 | |
| agg cga gtc ccg aag tca gat tct tgt cca gaa tcg tcc aat ggg gtg | 144 |
| Arg Arg Val Pro Lys Ser Asp Ser Cys Pro Glu Ser Ser Asn Gly Val | |
| 35 40 45 | |
| ttg atc tcc cca gag gtt tgc gct cca acc gat ttc cga cga gga tcg | 192 |
| Leu Ile Ser Pro Glu Val Cys Ala Pro Thr Asp Phe Arg Arg Gly Ser | |
| 50 55 60 | |
| tgg cgc ccg ctg agc aac gac tac cgt gcg gtc gag aca tac cgc tgt | 240 |
| Trp Arg Pro Leu Ser Asn Asp Tyr Arg Ala Val Glu Thr Tyr Arg Cys | |
| 65 70 75 80 | |
| gcg cca gga gcg aag gtg ggt tgc ccg atc acc gtg ctg gtg gta gat | 288 |
| Ala Pro Gly Ala Lys Val Gly Cys Pro Ile Thr Val Leu Val Val Asp | |
| 85 90 95 | |

gcc gag ccg aag gtc acc ttg gat gag gcg gaa gcc tgg cga gag cac 336
 Ala Glu Pro Lys Val Thr Leu Asp Glu Ala Glu Ala Trp Arg Glu His
 100 105 110

acc gag gcc gtg gcc gac gtc cgt gtc ttc tcc ggc ggg cat ttc ttc 384
 Thr Glu Ala Val Ala Asp Val Arg Val Phe Ser Gly Gly His Phe Phe
 115 120 125

atg acc gaa cgc cag gac gag gtg ctc gcg gtc ctt acg ggc gga tcg 432
 Met Thr Glu Arg Gln Asp Glu Val Leu Ala Val Leu Thr Gly Gly Ser
 130 135 140

ctt cga tgatcctcgc caggccgctg gaccagaccg cgacgccctt gggagccggc 488
 Leu Arg
 145

gtgcacatcg tcacggcagt gagggattgg gcatga 524

<210> 28
 <211> 146
 <212> PRT
 <213> *Saccharopolyspora spinosa*

<400> 28
 Val Ser Asn Val Trp Pro Glu Thr Trp Thr Pro Gly Phe Gly Arg Cys
 1 5 10 15
 Ser Ser Leu Leu Arg Arg Leu Gly Phe Arg Arg Asp Arg Asp Asp Ala
 20 25 30
 Arg Arg Val Pro Lys Ser Asp Ser Cys Pro Glu Ser Ser Asn Gly Val
 35 40 45
 Leu Ile Ser Pro Glu Val Cys Ala Pro Thr Asp Phe Arg Arg Gly Ser
 50 55 60
 Trp Arg Pro Leu Ser Asn Asp Tyr Arg Ala Val Glu Thr Tyr Arg Cys
 65 70 75 80
 Ala Pro Gly Ala Lys Val Gly Cys Pro Ile Thr Val Leu Val Val Asp
 85 90 95
 Ala Glu Pro Lys Val Thr Leu Asp Glu Ala Glu Ala Trp Arg Glu His
 100 105 110
 Thr Glu Ala Val Ala Asp Val Arg Val Phe Ser Gly Gly His Phe Phe
 115 120 125
 Met Thr Glu Arg Gln Asp Glu Val Leu Ala Val Leu Thr Gly Gly Ser
 130 135 140
 Leu Arg
 145

<210> 29
 <211> 1320
 <212> DNA
 <213> *Saccharopolyspora spinosa*

<220>
 <221> CDS
 <222> (1)..(1317)
 <223> ORF12; glycosyltransferase

<400> 29
 atg cgt gtc ctg ttc acc ccg ctg ccg gcg agt tcg cac ttc ttc aac 48
 Met Arg Val Leu Phe Thr Pro Leu Pro Ala Ser Ser His Phe Phe Asn
 1 5 10 15

 ctg gtg ccg ttg gcg tgg gcg ttg cgt gcc gcg ggg cac gag gtc cgt 96
 Leu Val Pro Leu Ala Trp Ala Leu Arg Ala Ala Gly His Glu Val Arg
 20 25 30

 gtc gcc atc tgc ccg aat atg gtg tcg atg gtc acc gga gca gga ctc 144
 Val Ala Ile Cys Pro Asn Met Val Ser Met Val Thr Gly Ala Gly Leu
 35 40 45

 acc gcg gtt ccc gtc ggc gac gag ctc gac ctc atc tcc ttg gcg gcc 192
 Thr Ala Val Pro Val Gly Asp Glu Leu Asp Leu Ile Ser Leu Ala Ala
 50 55 60

 aag aac gaa ctc gtt ctc ggc agc ggg gtc tcg ttc gac gag aag ggg 240
 Lys Asn Glu Leu Val Leu Gly Ser Gly Val Ser Phe Asp Glu Lys Gly
 65 70 75 80

 cgg cat ccg gaa ctc ttc gac gag ctg ctg tca atc aac tcc ggc aga 288
 Arg His Pro Glu Leu Phe Asp Glu Leu Leu Ser Ile Asn Ser Gly Arg
 85 90 95

 gac acg gac gcc gtg gag caa ctc cac ctt gtg gat gac cga tcg ctg 336
 Asp Thr Asp Ala Val Glu Gln Leu His Leu Val Asp Asp Arg Ser Leu
 100 105 110

 gac gat ctc atg ggg ttc gcc gag aaa tgg cag cct gat ctc gtt gtg 384
 Asp Asp Leu Met Gly Phe Ala Glu Lys Trp Gln Pro Asp Leu Val Val
 115 120 125

 tgg gac gct atg gtg tgt tcg ggg cca gtt gtg gcg cga gcg ctc ggc 432
 Trp Asp Ala Met Val Cys Ser Gly Pro Val Val Ala Arg Ala Leu Gly
 130 135 140

 gca cga cac gtg ccg atg ctc gtc gcc ctc gat gtg tcg ggg tgg ctg 480
 Ala Arg His Val Arg Met Leu Val Ala Leu Asp Val Ser Gly Trp Leu
 145 150 155 160

 cgg tcc ggt ttc ctc gaa tac cag gaa tcg aag ccg cct gag cag cgc 528
 Arg Ser Gly Phe Leu Glu Tyr Gln Glu Ser Lys Pro Pro Glu Gln Arg
 165 170 175

 gtc gac ccg ctc ggg acg tgg ctg gga gcg aag ctc gcc aag ttc gga 576
 Val Asp Pro Leu Gly Thr Trp Leu Gly Ala Lys Leu Ala Lys Phe Gly

| 180 | | | | | | 185 | | | | | | 190 | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|
| gcc | acg | ttc | gat | gaa | gag | atc | gtg | acg | ggc | caa | gcg | acc | ata | gat | ccg | 624 | | |
| Ala | Thr | Phe | Asp | Glu | Glu | Ile | Val | Thr | Gly | Gln | Ala | Thr | Ile | Asp | Pro | | | |
| | | 195 | | | | | 200 | | | | | 205 | | | | | | |
| att | cca | tcc | tgg | atg | cgc | ctg | cct | gtg | gac | ttg | gac | tac | atc | tcg | atg | 672 | | |
| Ile | Pro | Ser | Trp | Met | Arg | Leu | Pro | Val | Asp | Leu | Asp | Tyr | Ile | Ser | Met | | | |
| | | 210 | | | | 215 | | | | | 220 | | | | | | | |
| cgt | ttc | gtg | ccg | tac | aac | ggg | ccg | gcg | gtg | ttg | ccg | gag | tgg | ttg | cgc | 720 | | |
| Arg | Phe | Val | Pro | Tyr | Asn | Gly | Pro | Ala | Val | Leu | Pro | Glu | Trp | Leu | Arg | | | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | | | |
| gaa | cga | ccg | acg | aag | ccg | cgc | gtc | tgc | atc | acg | cgc | ggg | ctg | acc | aag | 768 | | |
| Glu | Arg | Pro | Thr | Lys | Pro | Arg | Val | Cys | Ile | Thr | Arg | Gly | Leu | Thr | Lys | | | |
| | | | | 245 | | | | 250 | | | | | | 255 | | | | |
| cgg | cgg | ctg | agc | agg | gtg | acc | gaa | cag | tac | ggg | gag | caa | agt | gac | cag | 816 | | |
| Arg | Arg | Leu | Ser | Arg | Val | Thr | Glu | Gln | Tyr | Gly | Glu | Gln | Ser | Asp | Gln | | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | | |
| gaa | caa | gca | atg | gtg | gaa | agg | ttg | ttg | cgc | ggc | gcg | gcc | agg | ctc | gac | 864 | | |
| Glu | Gln | Ala | Met | Val | Glu | Arg | Leu | Leu | Arg | Gly | Ala | Ala | Arg | Leu | Asp | | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | | |
| gtc | gag | gtg | atc | gcc | acc | ttg | tct | gac | gac | gaa | gta | cgg | gag | atg | ggg | 912 | | |
| Val | Glu | Val | Ile | Ala | Thr | Leu | Ser | Asp | Asp | Glu | Val | Arg | Glu | Met | Gly | | | |
| | | 290 | | | | 295 | | | | | 300 | | | | | | | |
| gag | ttg | ccc | tcg | aac | gtc | cgg | gtc | cac | gaa | tac | gta | ccg | ctc | aac | gaa | 960 | | |
| Glu | Leu | Pro | Ser | Asn | Val | Arg | Val | His | Glu | Tyr | Val | Pro | Leu | Asn | Glu | | | |
| 305 | | | | | 310 | | | | 315 | | | | | | 320 | | | |
| ctg | ctg | gag | tcg | tgt | tca | gtg | atc | atc | cat | cat | ggc | tcg | acg | acg | acg | 1008 | | |
| Leu | Leu | Glu | Ser | Cys | Ser | Val | Ile | Ile | His | His | Gly | Ser | Thr | Thr | Thr | | | |
| | | | | 325 | | | | | 330 | | | | | 335 | | | | |
| cag | gaa | acc | gcc | acg | gtc | aac | ggc | gta | ccg | cag | ttg | att | ctc | cct | ggg | 1056 | | |
| Gln | Glu | Thr | Ala | Thr | Val | Asn | Gly | Val | Pro | Gln | Leu | Ile | Leu | Pro | Gly | | | |
| | | | 340 | | | | | 345 | | | | | 350 | | | | | |
| acc | ttc | tgg | gac | gaa | tct | cgt | agg | gcg | gag | ctc | cta | gcc | gat | cgg | gga | 1104 | | |
| Thr | Phe | Trp | Asp | Glu | Ser | Arg | Arg | Ala | Glu | Leu | Leu | Ala | Asp | Arg | Gly | | | |
| | | 355 | | | | | 360 | | | | | 365 | | | | | | |
| gcc | ggg | ctg | gtc | ctc | gac | ccc | gcg | acg | ttt | acc | gaa | gac | gac | gtg | cga | 1152 | | |
| Ala | Gly | Leu | Val | Leu | Asp | Pro | Ala | Thr | Phe | Thr | Glu | Asp | Asp | Val | Arg | | | |
| | | 370 | | | | 375 | | | | | 380 | | | | | | | |
| ggg | cag | ctg | gcc | cgc | ctg | ctc | gac | gag | ccg | tcg | ttc | gct | gcc | aac | gcg | 1200 | | |
| Gly | Gln | Leu | Ala | Arg | Leu | Leu | Asp | Glu | Pro | Ser | Phe | Ala | Ala | Asn | Ala | | | |
| 385 | | | | | 390 | | | | 395 | | | | | | 400 | | | |
| gcg | ctg | atc | cgc | cgt | gaa | atc | gag | gaa | agt | ccc | agc | ccg | cac | gac | atc | 1248 | | |
| Ala | Leu | Ile | Arg | Arg | Glu | Ile | Glu | Glu | Ser | Pro | Ser | Pro | His | Asp | Ile | | | |
| | | | | 405 | | | | | 410 | | | | | 415 | | | | |

| | |
|-----------------------------------------------------------------|------|
| gtt cca cgt ctg gaa aag cta gtt gcc gaa cgt gag aac cgc cgc act | 1296 |
| Val Pro Arg Leu Glu Lys Leu Val Ala Glu Arg Glu Asn Arg Arg Thr | |
| 420 425 430 | |

| | |
|---------------------------------|------|
| ggg cag tct gat ggc cat ccg tga | 1320 |
| Gly Gln Ser Asp Gly His Pro | |
| 435 | |

<210> 30
 <211> 439
 <212> PRT
 <213> Saccharopolyspora spinosa

| | |
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| <400> 30 | |
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| 1 5 10 15 | |
| Leu Val Pro Leu Ala Trp Ala Leu Arg Ala Ala Gly His Glu Val Arg | |
| 20 25 30 | |
| Val Ala Ile Cys Pro Asn Met Val Ser Met Val Thr Gly Ala Gly Leu | |
| 35 40 45 | |
| Thr Ala Val Pro Val Gly Asp Glu Leu Asp Leu Ile Ser Leu Ala Ala | |
| 50 55 60 | |
| Lys Asn Glu Leu Val Leu Gly Ser Gly Val Ser Phe Asp Glu Lys Gly | |
| 65 70 75 80 | |
| Arg His Pro Glu Leu Phe Asp Glu Leu Leu Ser Ile Asn Ser Gly Arg | |
| 85 90 95 | |
| Asp Thr Asp Ala Val Glu Gln Leu His Leu Val Asp Asp Arg Ser Leu | |
| 100 105 110 | |
| Asp Asp Leu Met Gly Phe Ala Glu Lys Trp Gln Pro Asp Leu Val Val | |
| 115 120 125 | |
| Trp Asp Ala Met Val Cys Ser Gly Pro Val Val Ala Arg Ala Leu Gly | |
| 130 135 140 | |
| Ala Arg His Val Arg Met Leu Val Ala Leu Asp Val Ser Gly Trp Leu | |
| 145 150 155 160 | |
| Arg Ser Gly Phe Leu Glu Tyr Gln Glu Ser Lys Pro Pro Glu Gln Arg | |
| 165 170 175 | |
| Val Asp Pro Leu Gly Thr Trp Leu Gly Ala Lys Leu Ala Lys Phe Gly | |
| 180 185 190 | |
| Ala Thr Phe Asp Glu Glu Ile Val Thr Gly Gln Ala Thr Ile Asp Pro | |
| 195 200 205 | |
| Ile Pro Ser Trp Met Arg Leu Pro Val Asp Leu Asp Tyr Ile Ser Met | |
| 210 215 220 | |

Arg Phe Val Pro Tyr Asn Gly Pro Ala Val Leu Pro Glu Trp Leu Arg
 225 230 235 240
 Glu Arg Pro Thr Lys Pro Arg Val Cys Ile Thr Arg Gly Leu Thr Lys
 245 250 255
 Arg Arg Leu Ser Arg Val Thr Glu Gln Tyr Gly Glu Gln Ser Asp Gln
 260 265 270
 Glu Gln Ala Met Val Glu Arg Leu Leu Arg Gly Ala Ala Arg Leu Asp
 275 280 285
 Val Glu Val Ile Ala Thr Leu Ser Asp Asp Glu Val Arg Glu Met Gly
 290 295 300
 Glu Leu Pro Ser Asn Val Arg Val His Glu Tyr Val Pro Leu Asn Glu
 305 310 315 320
 Leu Leu Glu Ser Cys Ser Val Ile Ile His His Gly Ser Thr Thr Thr
 325 330 335
 Gln Glu Thr Ala Thr Val Asn Gly Val Pro Gln Leu Ile Leu Pro Gly
 340 345 350
 Thr Phe Trp Asp Glu Ser Arg Arg Ala Glu Leu Leu Ala Asp Arg Gly
 355 360 365
 Ala Gly Leu Val Leu Asp Pro Ala Thr Phe Thr Glu Asp Asp Val Arg
 370 375 380
 Gly Gln Leu Ala Arg Leu Leu Asp Glu Pro Ser Phe Ala Ala Asn Ala
 385 390 395 400
 Ala Leu Ile Arg Arg Glu Ile Glu Glu Ser Pro Ser Pro His Asp Ile
 405 410 415
 Val Pro Arg Leu Glu Lys Leu Val Ala Glu Arg Glu Asn Arg Arg Thr
 420 425 430
 Gly Gln Ser Asp Gly His Pro
 435

<210> 31
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<220>
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 <223> ORF13; 3,4-dehydratase

<400> 31
 atg cag agc cgg aaa acc aga gcg ctg ggg aaa ggg cgc gcc aga gtg 48

| Met | Gln | Ser | Arg | Lys | Thr | Arg | Ala | Leu | Gly | Lys | Gly | Arg | Ala | Arg | Val | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| act | tcg | tgt | gac | gac | act | tgc | gct | acc | gct | act | gag | atg | gtg | ccg | gat | 96 |
| Thr | Ser | Cys | Asp | Asp | Thr | Cys | Ala | Thr | Ala | Thr | Glu | Met | Val | Pro | Asp | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| gcc | aag | gac | cgg | ata | ttg | gca | tcc | gta | cgc | gat | tac | cac | cgc | gaa | cag | 144 |
| Ala | Lys | Asp | Arg | Ile | Leu | Ala | Ser | Val | Arg | Asp | Tyr | His | Arg | Glu | Gln | |
| | | | 35 | | | | 40 | | | | | 45 | | | | |
| gaa | tcc | ccg | acc | ttc | gtg | gct | gga | tcg | acg | ccg | atc | cgg | cca | tcg | ggc | 192 |
| Glu | Ser | Pro | Thr | Phe | Val | Ala | Gly | Ser | Thr | Pro | Ile | Arg | Pro | Ser | Gly | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| gcc | gtg | ctc | gac | gag | gac | gac | cgg | gtg | gca | ctg | gtg | gaa | gcc | gcg | ctg | 240 |
| Ala | Val | Leu | Asp | Glu | Asp | Asp | Arg | Val | Ala | Leu | Val | Glu | Ala | Ala | Leu | |
| | 65 | | | | 70 | | | | | 75 | | | | | 80 | |
| gag | ctc | cgg | atc | gcc | gcg | ggc | ggg | aat | gca | cgg | cga | ttc | gag | agc | gag | 288 |
| Glu | Leu | Arg | Ile | Ala | Ala | Gly | Gly | Asn | Ala | Arg | Arg | Phe | Glu | Ser | Glu | |
| | | | | 85 | | | | 90 | | | | | | 95 | | |
| ttc | gcc | cgc | ttc | ttc | ggc | ctc | cgc | aag | gct | cat | ctc | gtc | aac | tcc | ggc | 336 |
| Phe | Ala | Arg | Phe | Phe | Gly | Leu | Arg | Lys | Ala | His | Leu | Val | Asn | Ser | Gly | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| tcg | tcg | gcc | aat | ctc | ctg | gca | ctg | agt | tcg | ctt | acc | tcc | ccc | aaa | ctc | 384 |
| Ser | Ser | Ala | Asn | Leu | Leu | Ala | Leu | Ser | Ser | Leu | Thr | Ser | Pro | Lys | Leu | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| ggc | gag | gca | cga | ctg | cgg | ccc | ggc | gac | gaa | gtg | atc | act | gcg | gcg | gtc | 432 |
| Gly | Glu | Ala | Arg | Leu | Arg | Pro | Gly | Asp | Glu | Val | Ile | Thr | Ala | Ala | Val | |
| | 130 | | | | | 135 | | | | | 140 | | | | | |
| ggc | ttc | ccc | acg | acg | atc | aat | ccg | gcg | gtc | caa | aac | gga | ctc | gtc | ccg | 480 |
| Gly | Phe | Pro | Thr | Thr | Ile | Asn | Pro | Ala | Val | Gln | Asn | Gly | Leu | Val | Pro | |
| | 145 | | | | 150 | | | | | 155 | | | | | 160 | |
| gta | ttc | gtc | gac | gtg | gaa | ctg | ggc | acc | tac | aac | gca | acg | cca | gac | cgc | 528 |
| Val | Phe | Val | Asp | Val | Glu | Leu | Gly | Thr | Tyr | Asn | Ala | Thr | Pro | Asp | Arg | |
| | | | | 165 | | | | | 170 | | | | | 175 | | |
| atc | aag | gcc | gcc | gtc | acg | gaa | cgg | acg | cga | gcc | atc | atg | ctg | gcg | cac | 576 |
| Ile | Lys | Ala | Ala | Val | Thr | Glu | Arg | Thr | Arg | Ala | Ile | Met | Leu | Ala | His | |
| | | | 180 | | | | | 185 | | | | | 190 | | | |
| acc | ctg | ggc | aac | ccc | ttc | gcc | gct | gac | gaa | atc | gcg | gag | atc | gca | aaa | 624 |
| Thr | Leu | Gly | Asn | Pro | Phe | Ala | Ala | Asp | Glu | Ile | Ala | Glu | Ile | Ala | Lys | |
| | | 195 | | | | | 200 | | | | | 205 | | | | |
| gaa | cac | gag | ctg | ttc | ctc | gtc | gaa | gac | aac | tgt | gat | gcg | gtg | gga | tcc | 672 |
| Glu | His | Glu | Leu | Phe | Leu | Val | Glu | Asp | Asn | Cys | Asp | Ala | Val | Gly | Ser | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| acc | tac | cgg | gga | cgg | ctg | acc | gga | acc | ttc | ggc | gac | ctg | aca | acg | gtc | 720 |
| Thr | Tyr | Arg | Gly | Arg | Leu | Thr | Gly | Thr | Phe | Gly | Asp | Leu | Thr | Thr | Val | |

| | | | | | | | |
|-----------------------------------------------------------------|------|-----|--|-----|--|-----|--|
| 225 | | 230 | | 235 | | 240 | |
| agc ttc tat cct gcc cat cac atc acc agc ggc gag ggt ggc tgc gtg | 768 | | | | | | |
| Ser Phe Tyr Pro Ala His His Ile Thr Ser Gly Glu Gly Gly Cys Val | | | | | | | |
| | | 245 | | 250 | | 255 | |
| ttg acc ggc agc ctg gaa ttg gct cgc atc atc gag tcg ctg cgt gac | 816 | | | | | | |
| Leu Thr Gly Ser Leu Glu Leu Ala Arg Ile Ile Glu Ser Leu Arg Asp | | | | | | | |
| | | 260 | | 265 | | 270 | |
| tgg gga cgg gat tgc tgg tgc gag ccc ggc gtg gac aac acc tgc cgc | 864 | | | | | | |
| Trp Gly Arg Asp Cys Trp Cys Glu Pro Gly Val Asp Asn Thr Cys Arg | | | | | | | |
| | | 275 | | 280 | | 285 | |
| aag agg ttc gac tac cac ctc ggt acc ctt cca ccg ggc tac gac cac | 912 | | | | | | |
| Lys Arg Phe Asp Tyr His Leu Gly Thr Leu Pro Pro Gly Tyr Asp His | | | | | | | |
| | | 290 | | 295 | | 300 | |
| aag tac acg ttc tcc cac gtc ggt tac aac ctc aag acc acc gac ctg | 960 | | | | | | |
| Lys Tyr Thr Phe Ser His Val Gly Tyr Asn Leu Lys Thr Thr Asp Leu | | | | | | | |
| | | 305 | | 310 | | 315 | |
| cag gcc gca ctt gcg ctg agc cag ttg agc aag att tcc gca ttc ggg | 1008 | | | | | | |
| Gln Ala Ala Leu Ala Leu Ser Gln Leu Ser Lys Ile Ser Ala Phe Gly | | | | | | | |
| | | 325 | | 330 | | 335 | |
| tcg gca cgc cgc cgt aac tgg cga cgg ttg cgc gaa ggg ctg tcc ggg | 1056 | | | | | | |
| Ser Ala Arg Arg Arg Asn Trp Arg Arg Leu Arg Glu Gly Leu Ser Gly | | | | | | | |
| | | 340 | | 345 | | 350 | |
| ttg ccg ggc ctg ctg ctg ccg gta gcc aca ccg cac agc gac ccg agc | 1104 | | | | | | |
| Leu Pro Gly Leu Leu Leu Pro Val Ala Thr Pro His Ser Asp Pro Ser | | | | | | | |
| | | 355 | | 360 | | 365 | |
| tgg ttc ggg ttt gcg atc acc atc agt gcg gac gcc ggg ttc acc cgt | 1152 | | | | | | |
| Trp Phe Gly Phe Ala Ile Thr Ile Ser Ala Asp Ala Gly Phe Thr Arg | | | | | | | |
| | | 370 | | 375 | | 380 | |
| gcc gcc ctg gtg aac ttc ctg gaa tcc cgc aac atc ggc acc cga ctg | 1200 | | | | | | |
| Ala Ala Leu Val Asn Phe Leu Glu Ser Arg Asn Ile Gly Thr Arg Leu | | | | | | | |
| | | 385 | | 390 | | 395 | |
| ctg ttc ggc ggt aac atc acc cgg cac ccg gcc ttc gag cag gtg cgg | 1248 | | | | | | |
| Leu Phe Gly Gly Asn Ile Thr Arg His Pro Ala Phe Glu Gln Val Arg | | | | | | | |
| | | 405 | | 410 | | 415 | |
| tac cgg atc gcc gac gcg ctc acc aac agc gac atc gtc acc gac cga | 1296 | | | | | | |
| Tyr Arg Ile Ala Asp Ala Leu Thr Asn Ser Asp Ile Val Thr Asp Arg | | | | | | | |
| | | 420 | | 425 | | 430 | |
| acc ttc tgg gtc ggc gtc tac cca ggc ata acg gac caa atg atc gac | 1344 | | | | | | |
| Thr Phe Trp Val Gly Val Tyr Pro Gly Ile Thr Asp Gln Met Ile Asp | | | | | | | |
| | | 435 | | 440 | | 445 | |
| tac gtc gtc gaa tca atc gct gaa ttc gtg gcc aag agt tcc tag | 1389 | | | | | | |
| Tyr Val Val Glu Ser Ile Ala Glu Phe Val Ala Lys Ser Ser | | | | | | | |
| | | 450 | | 455 | | 460 | |

| 260 | | | | | 265 | | | | | 270 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Trp | Gly | Arg | Asp | Cys | Trp | Cys | Glu | Pro | Gly | Val | Asp | Asn | Thr | Cys | Arg |
| | 275 | | | | | | 280 | | | | | 285 | | | |
| Lys | Arg | Phe | Asp | Tyr | His | Leu | Gly | Thr | Leu | Pro | Pro | Gly | Tyr | Asp | His |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Lys | Tyr | Thr | Phe | Ser | His | Val | Gly | Tyr | Asn | Leu | Lys | Thr | Thr | Asp | Leu |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Gln | Ala | Ala | Leu | Ala | Leu | Ser | Gln | Leu | Ser | Lys | Ile | Ser | Ala | Phe | Gly |
| | | | 325 | | | | | | 330 | | | | | 335 | |
| Ser | Ala | Arg | Arg | Arg | Asn | Trp | Arg | Arg | Leu | Arg | Glu | Gly | Leu | Ser | Gly |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Leu | Pro | Gly | Leu | Leu | Leu | Pro | Val | Ala | Thr | Pro | His | Ser | Asp | Pro | Ser |
| | | 355 | | | | | 360 | | | | | 365 | | | |
| Trp | Phe | Gly | Phe | Ala | Ile | Thr | Ile | Ser | Ala | Asp | Ala | Gly | Phe | Thr | Arg |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Ala | Ala | Leu | Val | Asn | Phe | Leu | Glu | Ser | Arg | Asn | Ile | Gly | Thr | Arg | Leu |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Leu | Phe | Gly | Gly | Asn | Ile | Thr | Arg | His | Pro | Ala | Phe | Glu | Gln | Val | Arg |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Tyr | Arg | Ile | Ala | Asp | Ala | Leu | Thr | Asn | Ser | Asp | Ile | Val | Thr | Asp | Arg |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Thr | Phe | Trp | Val | Gly | Val | Tyr | Pro | Gly | Ile | Thr | Asp | Gln | Met | Ile | Asp |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Tyr | Val | Val | Glu | Ser | Ile | Ala | Glu | Phe | Val | Ala | Lys | Ser | Ser | | |
| | 450 | | | | | 455 | | | | | 460 | | | | |

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 <211> 1158
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
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 <223> ORF14; 4-aminotransferase

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| <400> 33 | | | | | | | | | | | | | | | | |
| gtg | atc | aac | ctg | cac | cag | ccg | atc | ctc | ggc | acc | gaa | gaa | ctc | gac | gcg | 48 |
| Val | Ile | Asn | Leu | His | Gln | Pro | Ile | Leu | Gly | Thr | Glu | Glu | Leu | Asp | Ala | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| | | | | | | | | | | | | | | | | |
| atc | gcg | gag | gtg | ttc | gcc | tcc | aac | tgg | atc | ggg | ctc | ggg | ccg | cgc | acc | 96 |
| Ile | Ala | Glu | Val | Phe | Ala | Ser | Asn | Trp | Ile | Gly | Leu | Gly | Pro | Arg | Thr | |

| 20 | | | | | | | | | | 25 | | | | | 30 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| cg | ac | tt | ga | gc | ga | tt | gc | ca | ca | ct | gg | gt | ga | cc | ga | 144 | | | | |
| Arg | Thr | Phe | Glu | Ala | Glu | Phe | Ala | His | His | Leu | Gly | Val | Asp | Pro | Glu | | | | | |
| 35 | | | 40 | | | | | 45 | | | | | | | | | | | | |
| ca | gt | gt | tt | ct | aa | tc | gg | ac | gc | gc | ct | tt | ct | ac | gt | 192 | | | | |
| Gln | Val | Val | Phe | Leu | Asn | Ser | Gly | Thr | Ala | Ala | Leu | Phe | Leu | Thr | Val | | | | | |
| 50 | | | 55 | | | | | 60 | | | | | | | | | | | | |
| ca | gt | ct | ga | ct | gg | cc | gg | ga | ga | gt | gt | ct | cc | tc | at | 240 | | | | |
| Gln | Val | Leu | Asp | Leu | Gly | Pro | Gly | Asp | Asp | Val | Val | Leu | Pro | Ser | Ile | | | | | |
| 65 | | 70 | | | | | 75 | | | 80 | | | | | | | | | | |
| ag | tt | gt | gc | gc | gc | aa | gc | at | gc | tc | tc | gg | gc | cg | cc | 288 | | | | |
| Ser | Phe | Val | Ala | Ala | Ala | Asn | Ala | Ile | Ala | Ser | Ser | Gly | Ala | Arg | Pro | | | | | |
| 85 | | | | | 90 | | | | | 95 | | | | | | | | | | |
| gt | tt | tg | ga | gt | ga | cc | cg | ac | tt | aa | cc | ac | ct | ga | ga | 336 | | | | |
| Val | Phe | Cys | Asp | Val | Asp | Pro | Arg | Thr | Leu | Asn | Pro | Thr | Leu | Asp | Asp | | | | | |
| 100 | | | 105 | | | | | 110 | | | | | | | | | | | | |
| gt | gc | ag | gc | at | ac | cc | gc | ac | aa | gc | gt | tt | ct | ct | ca | 384 | | | | |
| Val | Ala | Arg | Ala | Ile | Thr | Pro | Ala | Thr | Lys | Ala | Val | Leu | Leu | Leu | His | | | | | |
| 115 | | | 120 | | | | | 125 | | | | | | | | | | | | |
| ta | ga | ga | tc | cc | ga | ga | gt | ac | gc | at | gc | ga | tt | tg | cg | 432 | | | | |
| Tyr | Gly | Gly | Ser | Pro | Gly | Glu | Val | Thr | Ala | Ile | Ala | Asp | Phe | Cys | Arg | | | | | |
| 130 | | 135 | | | | | 140 | | | | | | | | | | | | | |
| ga | aa | gg | ct | at | ct | at | ga | ga | tc | gc | tg | gc | gt | ga | tc | 480 | | | | |
| Glu | Lys | Gly | Leu | Met | Leu | Ile | Glu | Asp | Ser | Ala | Cys | Ala | Val | Ala | Ser | | | | | |
| 145 | | 150 | | | | | 155 | | | 160 | | | | | | | | | | |
| tc | gt | ca | gg | ac | gc | tg | ga | ac | tt | gg | ga | ct | gc | ac | tg | 528 | | | | |
| Ser | Val | His | Gly | Thr | Ala | Cys | Gly | Thr | Phe | Gly | Asp | Leu | Ala | Thr | Trp | | | | | |
| 165 | | | | | 170 | | | | | 175 | | | | | | | | | | |
| ag | tt | ga | gc | at | aa | at | ct | gt | ac | gg | ga | gg | gg | at | tt | 576 | | | | |
| Ser | Phe | Asp | Ala | Met | Lys | Ile | Leu | Val | Thr | Gly | Asp | Gly | Gly | Met | Phe | | | | | |
| 180 | | | 185 | | | | | 190 | | | | | | | | | | | | |
| ta | gc | gc | ga | cc | ga | ct | gc | ca | cg | gc | aa | ca | ct | gc | ta | 624 | | | | |
| Tyr | Ala | Ala | Asp | Pro | Glu | Leu | Ala | His | Arg | Ala | Arg | Arg | Leu | Ala | Tyr | | | | | |
| 195 | | | 200 | | | | | 205 | | | | | | | | | | | | |
| ca | gg | ct | ga | ca | at | ag | ga | tt | ga | tc | gc | aa | tc | tc | aa | 672 | | | | |
| His | Gly | Leu | Glu | Gln | Met | Ser | Gly | Phe | Asp | Ser | Ala | Lys | Ser | Ser | Asn | | | | | |
| 210 | | 215 | | | | | 220 | | | | | | | | | | | | | |
| cg | tg | tg | ga | at | cg | gt | ga | ga | at | gg | ca | cg | ct | at | gg | 720 | | | | |
| Arg | Trp | Trp | Asp | Ile | Arg | Val | Glu | Asp | Ile | Gly | Gln | Arg | Leu | Ile | Gly | | | | | |
| 225 | | 230 | | | | | 235 | | | 240 | | | | | | | | | | |
| aa | ga | at | ac | gc | gc | ct | gg | ag | gt | ca | ct | cg | aa | ct | cc | 768 | | | | |
| Asn | Asp | Met | Thr | Ala | Ala | Leu | Gly | Ser | Val | Gln | Leu | Arg | Lys | Leu | Pro | | | | | |
| 245 | | | | | 250 | | | | | 255 | | | | | | | | | | |

| | |
|-----------------------------------------------------------------|------|
| gaa ttc atc aac agg cgt aga gaa atc gct acg cag tac gac cgg ttg | 816 |
| Glu Phe Ile Asn Arg Arg Arg Glu Ile Ala Thr Gln Tyr Asp Arg Leu | |
| 260 265 270 | |
| ctt tcc gat gtg ccg ggt gtc ctc cta ccg ccg acg cta ccg gat ggg | 864 |
| Leu Ser Asp Val Pro Gly Val Leu Leu Pro Pro Thr Leu Pro Asp Gly | |
| 275 280 285 | |
| cac gtc tcg tca cac tac ttc tac tgg gtc cag ctg gct ccg gag atc | 912 |
| His Val Ser Ser His Tyr Phe Tyr Trp Val Gln Leu Ala Pro Glu Ile | |
| 290 295 300 | |
| cgc gac cag gtg gcg cag caa atg ctg gaa cgc ggc atc tac acg agc | 960 |
| Arg Asp Gln Val Ala Gln Gln Met Leu Glu Arg Gly Ile Tyr Thr Ser | |
| 305 310 315 320 | |
| tac cgc tac ccg ccc ctg cac aag gtc ccc atc tac cgc gcg gac tgc | 1008 |
| Tyr Arg Tyr Pro Pro Leu His Lys Val Pro Ile Tyr Arg Ala Asp Cys | |
| 325 330 335 | |
| aag ctg cct tct gcg gag cac gcc tgc cgc aga aca ctc ctg cta cca | 1056 |
| Lys Leu Pro Ser Ala Glu His Ala Cys Arg Arg Thr Leu Leu Leu Pro | |
| 340 345 350 | |
| ctg cac cca agc ctt gac gac gcc gag gtg cgc acg gtg gct gac gag | 1104 |
| Leu His Pro Ser Leu Asp Asp Ala Glu Val Arg Thr Val Ala Asp Glu | |
| 355 360 365 | |
| ttc cag aag gcc gtc gaa cac cac atc agc caa aga tca cca ctc cga | 1152 |
| Phe Gln Lys Ala Val Glu His His Ile Ser Gln Arg Ser Pro Leu Arg | |
| 370 375 380 | |
| aag tga | 1158 |
| Lys | |
| 385 | |

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<400> 34
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 20 25 30
 Arg Thr Phe Glu Ala Glu Phe Ala His His Leu Gly Val Asp Pro Glu
 35 40 45
 Gln Val Val Phe Leu Asn Ser Gly Thr Ala Ala Leu Phe Leu Thr Val
 50 55 60
 Gln Val Leu Asp Leu Gly Pro Gly Asp Asp Val Val Leu Pro Ser Ile

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 65 | | | | | 70 | | | | | 75 | | | | 80 | |
| Ser | Phe | Val | Ala | Ala | Ala | Asn | Ala | Ile | Ala | Ser | Ser | Gly | Ala | Arg | Pro |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Val | Phe | Cys | Asp | Val | Asp | Pro | Arg | Thr | Leu | Asn | Pro | Thr | Leu | Asp | Asp |
| | | | 100 | | | | | 105 | | | | | 110 | | |
| Val | Ala | Arg | Ala | Ile | Thr | Pro | Ala | Thr | Lys | Ala | Val | Leu | Leu | Leu | His |
| | | 115 | | | | | 120 | | | | | 125 | | | |
| Tyr | Gly | Gly | Ser | Pro | Gly | Glu | Val | Thr | Ala | Ile | Ala | Asp | Phe | Cys | Arg |
| | 130 | | | | | 135 | | | | | 140 | | | | |
| Glu | Lys | Gly | Leu | Met | Leu | Ile | Glu | Asp | Ser | Ala | Cys | Ala | Val | Ala | Ser |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 |
| Ser | Val | His | Gly | Thr | Ala | Cys | Gly | Thr | Phe | Gly | Asp | Leu | Ala | Thr | Trp |
| | | | 165 | | | | | | 170 | | | | | 175 | |
| Ser | Phe | Asp | Ala | Met | Lys | Ile | Leu | Val | Thr | Gly | Asp | Gly | Gly | Met | Phe |
| | | 180 | | | | | | 185 | | | | | 190 | | |
| Tyr | Ala | Ala | Asp | Pro | Glu | Leu | Ala | His | Arg | Ala | Arg | Arg | Leu | Ala | Tyr |
| | 195 | | | | | | 200 | | | | | 205 | | | |
| His | Gly | Leu | Glu | Gln | Met | Ser | Gly | Phe | Asp | Ser | Ala | Lys | Ser | Ser | Asn |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Arg | Trp | Trp | Asp | Ile | Arg | Val | Glu | Asp | Ile | Gly | Gln | Arg | Leu | Ile | Gly |
| 225 | | | | 230 | | | | | | 235 | | | | 240 | |
| Asn | Asp | Met | Thr | Ala | Ala | Leu | Gly | Ser | Val | Gln | Leu | Arg | Lys | Leu | Pro |
| | | | 245 | | | | | | 250 | | | | | 255 | |
| Glu | Phe | Ile | Asn | Arg | Arg | Arg | Glu | Ile | Ala | Thr | Gln | Tyr | Asp | Arg | Leu |
| | | 260 | | | | | | 265 | | | | 270 | | | |
| Leu | Ser | Asp | Val | Pro | Gly | Val | Leu | Leu | Pro | Pro | Thr | Leu | Pro | Asp | Gly |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| His | Val | Ser | Ser | His | Tyr | Phe | Tyr | Trp | Val | Gln | Leu | Ala | Pro | Glu | Ile |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Arg | Asp | Gln | Val | Ala | Gln | Gln | Met | Leu | Glu | Arg | Gly | Ile | Tyr | Thr | Ser |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Tyr | Arg | Tyr | Pro | Pro | Leu | His | Lys | Val | Pro | Ile | Tyr | Arg | Ala | Asp | Cys |
| | | | 325 | | | | | | 330 | | | | | 335 | |
| Lys | Leu | Pro | Ser | Ala | Glu | His | Ala | Cys | Arg | Arg | Thr | Leu | Leu | Leu | Pro |
| | | | 340 | | | | | 345 | | | | 350 | | | |
| Leu | His | Pro | Ser | Leu | Asp | Asp | Ala | Glu | Val | Arg | Thr | Val | Ala | Asp | Glu |
| | 355 | | | | | | 360 | | | | | 365 | | | |
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 Lys
 385

375
 380

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 <212> DNA
 <213> Saccharopolyspora spinosa

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 <223> ORF15; N-dimethyltransferase

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 Pro Asp His Ala Asp Ile Tyr Asp Ala Ile His Ser Ala Arg Gly Arg
 20 25 30
 gac tgg gca gcc gag gcc ggg gaa gta gtc cag ctc gta cgc acc agg 144
 Asp Trp Ala Ala Glu Ala Gly Glu Val Val Gln Leu Val Arg Thr Arg
 35 40 45
 ctg ccc gaa gca cag tcc cta ctc gac gtc gcc tgt ggg acc ggg gcg 192
 Leu Pro Glu Ala Gln Ser Leu Leu Asp Val Ala Cys Gly Thr Gly Ala
 50 55 60
 cac cta gag cga ttc cgt gcc gaa tac gcg aag gtc gcg ggg ctt gaa 240
 His Leu Glu Arg Phe Arg Ala Glu Tyr Ala Lys Val Ala Gly Leu Glu
 65 70 75 80
 ctg tcc gat gcg atg cgg gag atc gcg atc aga cga gtc cct gag gta 288
 Leu Ser Asp Ala Met Arg Glu Ile Ala Ile Arg Arg Val Pro Glu Val
 85 90 95
 ccg att cac atc ggt gac atc cgc gat ttc gac ctc ggc gag cca ttc 336
 Pro Ile His Ile Gly Asp Ile Arg Asp Phe Asp Leu Gly Glu Pro Phe
 100 105 110
 gac gtc atc acc tgc ctg tgc ttt acc gcg gct tac atg cgg acc gtt 384
 Asp Val Ile Thr Cys Leu Cys Phe Thr Ala Ala Tyr Met Arg Thr Val
 115 120 125
 gac gac ctg cga cgc gtg acg cgg aac atg gcc cgg cac ctg gcc cct 432
 Asp Asp Leu Arg Arg Val Thr Arg Asn Met Ala Arg His Leu Ala Pro
 130 135 140
 ggt gga gtc gcg gtc atc gaa ccc tgg tgg ttt ccc gac aag ttc atc 480
 Gly Gly Val Ala Val Ile Glu Pro Trp Trp Phe Pro Asp Lys Phe Ile
 145 150 155 160

gac ggg ttc gtc acc gga gcc gtc gcg cac cac ggc gag cgg gtg atc 528
 Asp Gly Phe Val Thr Gly Ala Val Ala His His Gly Glu Arg Val Ile
 165 170 175
 agc cgg cta tcg cac tcg gtc ctg gag ggc cgt acg agc cgg atg acc 576
 Ser Arg Leu Ser His Ser Val Leu Glu Gly Arg Thr Ser Arg Met Thr
 180 185 190
 gtc cgc tac aca gtc gcc gaa ccc acc ggg atc cgg gac ttc aca gag 624
 Val Arg Tyr Thr Val Ala Glu Pro Thr Gly Ile Arg Asp Phe Thr Glu
 195 200 205
 ttc gaa atc ctc tcg ctg ttc act gag gac gag tac acc gcc gcg ctc 672
 Phe Glu Ile Leu Ser Leu Phe Thr Glu Asp Glu Tyr Thr Ala Ala Leu
 210 215 220
 gaa gac gca ggg atc cgc gcg gaa tac ctt cct gga gca ccg aac ggc 720
 Glu Asp Ala Gly Ile Arg Ala Glu Tyr Leu Pro Gly Ala Pro Asn Gly
 225 230 235 240
 cga ggc ctg ttc gtc gga atc cgc aac tga 750
 Arg Gly Leu Phe Val Gly Ile Arg Asn
 245

<210> 36
 <211> 249
 <212> PRT
 <213> Saccharopolyspora spinosa

<400> 36
 Met Ser Arg Val Ser Asp Thr Phe Ala Glu Thr Ser Ser Val Tyr Ser
 1 5 10 15
 Pro Asp His Ala Asp Ile Tyr Asp Ala Ile His Ser Ala Arg Gly Arg
 20 25 30
 Asp Trp Ala Ala Glu Ala Gly Glu Val Val Gln Leu Val Arg Thr Arg
 35 40 45
 Leu Pro Glu Ala Gln Ser Leu Leu Asp Val Ala Cys Gly Thr Gly Ala
 50 55 60
 His Leu Glu Arg Phe Arg Ala Glu Tyr Ala Lys Val Ala Gly Leu Glu
 65 70 75 80
 Leu Ser Asp Ala Met Arg Glu Ile Ala Ile Arg Arg Val Pro Glu Val
 85 90 95
 Pro Ile His Ile Gly Asp Ile Arg Asp Phe Asp Leu Gly Glu Pro Phe
 100 105 110
 Asp Val Ile Thr Cys Leu Cys Phe Thr Ala Ala Tyr Met Arg Thr Val
 115 120 125
 Asp Asp Leu Arg Arg Val Thr Arg Asn Met Ala Arg His Leu Ala Pro

| 130 | 135 | 140 |
|-----------------------------------------------------------------|-----|---------|
| Gly Gly Val Ala Val Ile Glu Pro Trp Trp Phe Pro Asp Lys Phe Ile | | |
| 145 | 150 | 155 160 |
| Asp Gly Phe Val Thr Gly Ala Val Ala His His Gly Glu Arg Val Ile | | |
| | 165 | 170 175 |
| Ser Arg Leu Ser His Ser Val Leu Glu Gly Arg Thr Ser Arg Met Thr | | |
| | 180 | 185 190 |
| Val Arg Tyr Thr Val Ala Glu Pro Thr Gly Ile Arg Asp Phe Thr Glu | | |
| | 195 | 200 205 |
| Phe Glu Ile Leu Ser Leu Phe Thr Glu Asp Glu Tyr Thr Ala Ala Leu | | |
| | 210 | 215 220 |
| Glu Asp Ala Gly Ile Arg Ala Glu Tyr Leu Pro Gly Ala Pro Asn Gly | | |
| 225 | 230 | 235 240 |
| Arg Gly Leu Phe Val Gly Ile Arg Asn | | |
| | 245 | |

<210> 37
 <211> 726
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(723)
 <223> ORF16; 3,4-reductase

| | |
|-----------------------------------------------------------------|-----|
| <400> 37 | |
| atg agc gaa cag acg att gca ctg gtc acc ggc gca aac aag gga atc | 48 |
| Met Ser Glu Gln Thr Ile Ala Leu Val Thr Gly Ala Asn Lys Gly Ile | |
| 1 5 10 15 | |
| gga tac gag atc gcg gcc ggg ctc ggc gcg ctg ggg tgg agc gtc gga | 96 |
| Gly Tyr Glu Ile Ala Ala Gly Leu Gly Ala Leu Gly Trp Ser Val Gly | |
| 20 25 30 | |
| atc ggg gca cgg gac cac cag cgc ggg gag gat gcc gtg gcg aaa ttg | 144 |
| Ile Gly Ala Arg Asp His Gln Arg Gly Glu Asp Ala Val Ala Lys Leu | |
| 35 40 45 | |
| cgt gcg gac ggc gtc gat gcg ttc gcg gta tcc ctg gac gtg aca gac | 192 |
| Arg Ala Asp Gly Val Asp Ala Phe Ala Val Ser Leu Asp Val Thr Asp | |
| 50 55 60 | |
| gac gcg agc gtc gcg gct gct gcg gct ctg ctc gag gag cgc gcc ggc | 240 |
| Asp Ala Ser Val Ala Ala Ala Ala Ala Leu Leu Glu Glu Arg Ala Gly | |
| 65 70 75 80 | |
| cgg ctc gat gtg ctg gtt aat aac gcc ggc atc gcc ggg gca tgg ccg | 288 |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Leu | Asp | Val | Leu | Val | Asn | Asn | Ala | Gly | Ile | Ala | Gly | Ala | Trp | Pro | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| gag | gag | ccc | tcg | acc | gtc | aca | ccg | gcg | agc | ctc | cgg | gcg | gtg | gtg | gag | 336 |
| Glu | Glu | Pro | Ser | Thr | Val | Thr | Pro | Ala | Ser | Leu | Arg | Ala | Val | Val | Glu | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| acc | aac | gtg | atc | ggc | gtc | gtt | cgg | gtt | acc | aac | gct | atg | ctg | ccg | ttg | 384 |
| Thr | Asn | Val | Ile | Gly | Val | Val | Arg | Val | Thr | Asn | Ala | Met | Leu | Pro | Leu | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |
| cta | cgc | cgc | tcc | gag | cgc | ccg | cgg | atc | gtc | aac | cag | tcc | agc | cac | gtc | 432 |
| Leu | Arg | Arg | Ser | Glu | Arg | Pro | Arg | Ile | Val | Asn | Gln | Ser | Ser | His | Val | |
| | 130 | | | | | | 135 | | | | 140 | | | | | |
| gct | tcc | ctg | acc | ttg | caa | acc | acg | ccg | ggc | gtc | gac | ctc | ggc | ggg | atc | 480 |
| Ala | Ser | Leu | Thr | Leu | Gln | Thr | Thr | Pro | Gly | Val | Asp | Leu | Gly | Gly | Ile | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| agc | gga | gcc | tac | tca | ccg | tcg | aag | acg | ttc | ctc | aac | gcg | atc | acc | atc | 528 |
| Ser | Gly | Ala | Tyr | Ser | Pro | Ser | Lys | Thr | Phe | Leu | Asn | Ala | Ile | Thr | Ile | |
| | | | 165 | | | | | | 170 | | | | | 175 | | |
| cag | tac | gcc | aag | gaa | ctc | agc | gat | acc | aac | atc | aaa | atc | aac | aac | gcc | 576 |
| Gln | Tyr | Ala | Lys | Glu | Leu | Ser | Asp | Thr | Asn | Ile | Lys | Ile | Asn | Asn | Ala | |
| | | 180 | | | | | | 185 | | | | | 190 | | | |
| tgc | ccc | ggc | tac | gtc | gcg | acc | gac | ctt | aac | ggc | ttc | cac | gga | acc | agc | 624 |
| Cys | Pro | Gly | Tyr | Val | Ala | Thr | Asp | Leu | Asn | Gly | Phe | His | Gly | Thr | Ser | |
| | 195 | | | | | | 200 | | | | | 205 | | | | |
| acg | ccg | gca | gac | ggc | agg | atc | gcc | att | cgg | ctc | gcc | acg | ctg | cca | | 672 |
| Thr | Pro | Ala | Asp | Gly | Ala | Arg | Ile | Ala | Ile | Arg | Leu | Ala | Thr | Leu | Pro | |
| | 210 | | | | | 215 | | | | | 220 | | | | | |
| gac | gac | ggc | ccg | acc | gga | ggc | atg | ttc | gac | gac | gcc | ggg | aat | gtg | ccc | 720 |
| Asp | Asp | Gly | Pro | Thr | Gly | Gly | Met | Phe | Asp | Asp | Ala | Gly | Asn | Val | Pro | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | |
| tgg | tga | | | | | | | | | | | | | | | 726 |
| Trp | | | | | | | | | | | | | | | | |

<210> 38
 <211> 241
 <212> PRT
 <213> Saccharopolyspora spinosa

<400> 38
 Met Ser Glu Gln Thr Ile Ala Leu Val Thr Gly Ala Asn Lys Gly Ile
 1 5 10 15
 Gly Tyr Glu Ile Ala Ala Gly Leu Gly Ala Leu Gly Trp Ser Val Gly
 20 25 30
 Ile Gly Ala Arg Asp His Gln Arg Gly Glu Asp Ala Val Ala Lys Leu
 35 40 45

Arg Ala Asp Gly Val Asp Ala Phe Ala Val Ser Leu Asp Val Thr Asp
 50 55 60
 Asp Ala Ser Val Ala Ala Ala Ala Leu Leu Glu Glu Arg Ala Gly
 65 70 75 80
 Arg Leu Asp Val Leu Val Asn Asn Ala Gly Ile Ala Gly Ala Trp Pro
 85 90 95
 Glu Glu Pro Ser Thr Val Thr Pro Ala Ser Leu Arg Ala Val Val Glu
 100 105 110
 Thr Asn Val Ile Gly Val Val Arg Val Thr Asn Ala Met Leu Pro Leu
 115 120 125
 Leu Arg Arg Ser Glu Arg Pro Arg Ile Val Asn Gln Ser Ser His Val
 130 135 140
 Ala Ser Leu Thr Leu Gln Thr Thr Pro Gly Val Asp Leu Gly Gly Ile
 145 150 155 160
 Ser Gly Ala Tyr Ser Pro Ser Lys Thr Phe Leu Asn Ala Ile Thr Ile
 165 170 175
 Gln Tyr Ala Lys Glu Leu Ser Asp Thr Asn Ile Lys Ile Asn Asn Ala
 180 185 190
 Cys Pro Gly Tyr Val Ala Thr Asp Leu Asn Gly Phe His Gly Thr Ser
 195 200 205
 Thr Pro Ala Asp Gly Ala Arg Ile Ala Ile Arg Leu Ala Thr Leu Pro
 210 215 220
 Asp Asp Gly Pro Thr Gly Gly Met Phe Asp Asp Ala Gly Asn Val Pro
 225 230 235 240
 Trp

<210> 39
 <211> 837
 <212> DNA
 <213> Saccharopolyspora spinosa

 <220>
 <221> CDS
 <222> (1)..(834)
 <223> ORF17; transcription regulator

<400> 39
 atg gag acg cgg gag ttg cgg tac ttc gtt gca gtc gcc gag gag ttg 48
 Met Glu Thr Arg Glu Leu Arg Tyr Phe Val Ala Val Ala Glu Glu Leu
 1 5 10 15

| | |
|-----------------------------------------------------------------|-----|
| cac ttc ggc cgg gcc gcc cag cgc ctg ggc atc gcc cag ccg ccg ctg | 96 |
| His Phe Gly Arg Ala Ala Gln Arg Leu Gly Ile Ala Gln Pro Pro Leu | |
| 20 25 30 | |
| tcg cgg acg atc gcc cag ctc gag caa cga ctc gga gtc gtg ttg ctg | 144 |
| Ser Arg Thr Ile Ala Gln Leu Glu Gln Arg Leu Gly Val Val Leu Leu | |
| 35 40 45 | |
| caa cgc acc agc cgc aaa gtc tgc ctc acc gaa gcc ggg gca atg ctg | 192 |
| Gln Arg Thr Ser Arg Lys Val Ser Leu Thr Glu Ala Gly Ala Met Leu | |
| 50 55 60 | |
| ctg acc gaa ggc cgg gcg atc ctc ggc gcg ctg gca gca gcc gag cga | 240 |
| Leu Thr Glu Gly Arg Ala Ile Leu Gly Ala Leu Ala Ala Ala Glu Arg | |
| 65 70 75 80 | |
| cgc acc cag cgt gcc gcg acg agc cag ccc tgc cta gtc ctg gct gcc | 288 |
| Arg Thr Gln Arg Ala Ala Thr Ser Gln Pro Ser Leu Val Leu Ala Ala | |
| 85 90 95 | |
| aag gcc ggc gcc tcc ggt gag ctg ctg gcg aag ttg ctc gac gcg tac | 336 |
| Lys Ala Gly Ala Ser Gly Glu Leu Leu Ala Lys Leu Leu Asp Ala Tyr | |
| 100 105 110 | |
| gcc gcc gag ccg gga gcc gtg gcc gtc gac ctg ctg ctc tgc gaa tcc | 384 |
| Ala Ala Glu Pro Gly Ala Val Ala Val Asp Leu Leu Leu Cys Glu Ser | |
| 115 120 125 | |
| cag ccc cag aaa acg ctg cat gac ggc cgg gcc gac gtg gcg ctg ttg | 432 |
| Gln Pro Gln Lys Thr Leu His Asp Gly Arg Ala Asp Val Ala Leu Leu | |
| 130 135 140 | |
| cat caa ccc ttc gac ccg acg gcc gaa ctc gac atc gaa att ctg aac | 480 |
| His Gln Pro Phe Asp Pro Thr Ala Glu Leu Asp Ile Glu Ile Leu Asn | |
| 145 150 155 160 | |
| acc gag caa caa gtc gcc att ctt ccg acc tgc cat ccg ctt gcc agc | 528 |
| Thr Glu Gln Gln Val Ala Ile Leu Pro Thr Ser His Pro Leu Ala Ser | |
| 165 170 175 | |
| gag ccc cat gta cgg atg gcg gat gtc agc tca ctg ccg gat ctc ccg | 576 |
| Glu Pro His Val Arg Met Ala Asp Val Ser Ser Leu Pro Asp Leu Pro | |
| 180 185 190 | |
| ctt gcg cgc tgg ccc ggc ccc gac ggc gtc tat cca gat ggc ccc ggc | 624 |
| Leu Ala Arg Trp Pro Gly Pro Asp Gly Val Tyr Pro Asp Gly Pro Gly | |
| 195 200 205 | |
| gtg gaa gta cgc aac cag acg caa ctg ttc caa atg atc gca ctc ggc | 672 |
| Val Glu Val Arg Asn Gln Thr Gln Leu Phe Gln Met Ile Ala Leu Gly | |
| 210 215 220 | |
| cgc act acc gtg gtc atg ccc gaa tcc agt cgc gtc aac ctg ctc gaa | 720 |
| Arg Thr Thr Val Val Met Pro Glu Ser Ser Arg Val Asn Leu Leu Glu | |
| 225 230 235 240 | |
| ggc ctc gcc gcc gta ccg gtt cta gac gcg ccg gac gtg acg aca gtc | 768 |

Gly Leu Ala Ala Val Pro Val Leu Asp Ala Pro Asp Val Thr Thr Val
245 250 255

atc gcc tgg ccg ccc cac agc cgc tcc cga gca ctc gcc ggc ttg gtc 816
Ile Ala Trp Pro Pro His Ser Arg Ser Arg Ala Leu Ala Gly Leu Val
260 265 270

cgc gtg gcc aca ctc ctc taa 837
Arg Val Ala Thr Leu Leu
275

<210> 40
<211> 278
<212> PRT
<213> Saccharopolyspora spinosa

<400> 40
Met Glu Thr Arg Glu Leu Arg Tyr Phe Val Ala Val Ala Glu Glu Leu
1 5 10 15

His Phe Gly Arg Ala Ala Gln Arg Leu Gly Ile Ala Gln Pro Pro Leu
20 25 30

Ser Arg Thr Ile Ala Gln Leu Glu Gln Arg Leu Gly Val Val Leu Leu
35 40 45

Gln Arg Thr Ser Arg Lys Val Ser Leu Thr Glu Ala Gly Ala Met Leu
50 55 60

Leu Thr Glu Gly Arg Ala Ile Leu Gly Ala Leu Ala Ala Ala Glu Arg
65 70 75 80

Arg Thr Gln Arg Ala Ala Thr Ser Gln Pro Ser Leu Val Leu Ala Ala
85 90 95

Lys Ala Gly Ala Ser Gly Glu Leu Leu Ala Lys Leu Leu Asp Ala Tyr
100 105 110

Ala Ala Glu Pro Gly Ala Val Ala Val Asp Leu Leu Leu Cys Glu Ser
115 120 125

Gln Pro Gln Lys Thr Leu His Asp Gly Arg Ala Asp Val Ala Leu Leu
130 135 140

His Gln Pro Phe Asp Pro Thr Ala Glu Leu Asp Ile Glu Ile Leu Asn
145 150 155 160

Thr Glu Gln Gln Val Ala Ile Leu Pro Thr Ser His Pro Leu Ala Ser
165 170 175

Glu Pro His Val Arg Met Ala Asp Val Ser Ser Leu Pro Asp Leu Pro
180 185 190

Leu Ala Arg Trp Pro Gly Pro Asp Gly Val Tyr Pro Asp Gly Pro Gly
195 200 205

Val Glu Val Arg Asn Gln Thr Gln Leu Phe Gln Met Ile Ala Leu Gly
 210 215 220

Arg Thr Thr Val Val Met Pro Glu Ser Ser Arg Val Asn Leu Leu Glu
 225 230 235 240

Gly Leu Ala Ala Val Pro Val Leu Asp Ala Pro Asp Val Thr Thr Val
 245 250 255

Ile Ala Trp Pro Pro His Ser Arg Ser Arg Ala Leu Ala Gly Leu Val
 260 265 270

Arg Val Ala Thr Leu Leu
 275

<210> 41
 <211> 7788
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(7785)
 <223> ORF18; polyketide synthase

<400> 41
 atg agc gaa gcc ggg aac ctg ata gcc gtc atc gga ctg tcc tgc cgc 48
 Met Ser Glu Ala Gly Asn Leu Ile Ala Val Ile Gly Leu Ser Cys Arg
 1 5 10 15

cta ccc cag gcg cct gac ccg gct tcc ttc tgg cgg ttg ctg cgc acc 96
 Leu Pro Gln Ala Pro Asp Pro Ala Ser Phe Trp Arg Leu Leu Arg Thr
 20 25 30

gga acg gac gcc atc acc acg gtc ccg gaa ggg cgg tgg ggc gac ccg 144
 Gly Thr Asp Ala Ile Thr Thr Val Pro Glu Gly Arg Trp Gly Asp Pro
 35 40 45

ttg cct ggt cgg gat gcg ccc aag ggc ccg gaa tgg ggt ggt ttc ctg 192
 Leu Pro Gly Arg Asp Ala Pro Lys Gly Pro Glu Trp Gly Gly Phe Leu
 50 55 60

gct gat gtc gac tgc ttc gat ccc gag ttc ttc ggg atc tcg ccg cga 240
 Ala Asp Val Asp Cys Phe Asp Pro Glu Phe Phe Gly Ile Ser Pro Arg
 65 70 75 80

gaa gcg gca gcc gtg gat ccc cag cag agg ctg gct ctg gag ctc gcc 288
 Glu Ala Ala Ala Val Asp Pro Gln Gln Arg Leu Ala Leu Glu Leu Ala
 85 90 95

tgg gag gca ctc gaa gac gcc ggt atc ccc gcc ggc gag ctg cgc ggt 336
 Trp Glu Ala Leu Glu Asp Ala Gly Ile Pro Ala Gly Glu Leu Arg Gly
 100 105 110

act gcc gcc ggt gtg ttc atg ggg gcg atc tct gac gac tac gcc gcc 384

| | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Thr | Ala | Ala | Gly | Val | Phe | Met | Gly | Ala | Ile | Ser | Asp | Asp | Tyr | Ala | Ala | | |
| | | 115 | | | | | 120 | | | | | 125 | | | | | |
| ctg | ctg | cgc | gag | agc | ccg | ccg | gaa | gtg | gct | gcg | cag | tac | cgc | ctc | acc | 432 | |
| Leu | Leu | Arg | Glu | Ser | Pro | Pro | Glu | Val | Ala | Ala | Gln | Tyr | Arg | Leu | Thr | | |
| | | 130 | | | | 135 | | | | | 140 | | | | | | |
| ggc | acc | cat | cga | agc | ctg | atc | gcc | aac | cgc | gtg | tcc | tat | gtg | ctc | ggc | 480 | |
| Gly | Thr | His | Arg | Ser | Leu | Ile | Ala | Asn | Arg | Val | Ser | Tyr | Val | Leu | Gly | | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | | |
| ctg | cgc | ggg | cca | agc | ctg | acg | gtg | gat | tca | ggg | cag | tcc | tcg | tcc | ctg | 528 | |
| Leu | Arg | Gly | Pro | Ser | Leu | Thr | Val | Asp | Ser | Gly | Gln | Ser | Ser | Ser | Leu | | |
| | | | | 165 | | | | | 170 | | | | | 175 | | | |
| gtc | ggc | gtg | cat | ctc | gcc | agc | gag | agc | ctg | cga | cgg | ggg | gag | tgc | acg | 576 | |
| Val | Gly | Val | His | Leu | Ala | Ser | Glu | Ser | Leu | Arg | Arg | Gly | Glu | Cys | Thr | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | |
| atc | gca | ctc | gcc | ggc | ggc | gtg | aac | ctc | aac | ctg | gcc | gcc | gag | agc | aac | 624 | |
| Ile | Ala | Leu | Ala | Gly | Gly | Val | Asn | Leu | Asn | Leu | Ala | Ala | Glu | Ser | Asn | | |
| | | 195 | | | | 200 | | | | | 205 | | | | | | |
| agc | gct | ctg | atg | gac | ttc | ggc | gcg | ctc | tcc | ccg | gac | ggg | cgc | tgc | ttc | 672 | |
| Ser | Ala | Leu | Met | Asp | Phe | Gly | Ala | Leu | Ser | Pro | Asp | Gly | Arg | Cys | Phe | | |
| | 210 | | | | | 215 | | | | | 220 | | | | | | |
| acc | ttc | gat | gtg | cgg | gcg | aac | ggg | tac | gtc | cgt | ggg | gag | ggc | ggc | ggc | 720 | |
| Thr | Phe | Asp | Val | Arg | Ala | Asn | Gly | Tyr | Val | Arg | Gly | Glu | Gly | Gly | Gly | | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | | |
| ctt | gtc | gtg | ctg | aag | aag | gcc | gat | cag | gcg | cac | gcc | gat | ggc | gac | cgg | 768 | |
| Leu | Val | Val | Leu | Lys | Lys | Ala | Asp | Gln | Ala | His | Ala | Asp | Gly | Asp | Arg | | |
| | | | | 245 | | | | 250 | | | | | | 255 | | | |
| atc | tac | tgc | ctc | atc | cgc | ggc | agc | gcg | gtc | aac | aac | gat | ggg | ggc | ggg | 816 | |
| Ile | Tyr | Cys | Leu | Ile | Arg | Gly | Ser | Ala | Val | Asn | Asn | Asp | Gly | Gly | Gly | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | |
| gcc | ggg | ctc | acc | gtt | ccg | gcg | gcg | gac | gcc | cag | gcg | gag | ctg | ctg | cgc | 864 | |
| Ala | Gly | Leu | Thr | Val | Pro | Ala | Ala | Asp | Ala | Gln | Ala | Glu | Leu | Leu | Arg | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | |
| cag | gca | tac | cgg | aac | gcg | ggc | gtc | gac | ccg | gcc | gcc | gtg | cag | tat | gtc | 912 | |
| Gln | Ala | Tyr | Arg | Asn | Ala | Gly | Val | Asp | Pro | Ala | Ala | Val | Gln | Tyr | Val | | |
| | 290 | | | | | 295 | | | | | 300 | | | | | | |
| gag | ctc | cac | ggc | agc | gcg | acc | agg | gtc | ggg | gat | ccc | gtc | gaa | gca | gca | 960 | |
| Glu | Leu | His | Gly | Ser | Ala | Thr | Arg | Val | Gly | Asp | Pro | Val | Glu | Ala | Ala | | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | | |
| gcc | ctc | gga | gct | gtc | ctg | ggg | gcg | gcg | aga | cgg | ccc | ggc | gac | gag | ctg | 1008 | |
| Ala | Leu | Gly | Ala | Val | Leu | Gly | Ala | Ala | Arg | Arg | Pro | Gly | Asp | Glu | Leu | | |
| | | | | 325 | | | | 330 | | | | | | 335 | | | |
| cgt | gtg | ggg | tcg | gcg | aag | acc | aac | gtc | ggc | cat | ctg | gaa | gca | gcg | gcg | 1056 | |
| Arg | Val | Gly | Ser | Ala | Lys | Thr | Asn | Val | Gly | His | Leu | Glu | Ala | Ala | Ala | | |

| 340 | | | | | | 345 | | | | | | 350 | | | | | | |
|-----------------------------------------------------------------|------|--|--|--|--|-----|--|--|--|--|--|-----|--|--|--|--|--|--|
| ggc gtc acc ggg ttg ctg aag acc gca ctc agc atc tgg cac cgc gaa | 1104 | | | | | | | | | | | | | | | | | |
| Gly Val Thr Gly Leu Leu Lys Thr Ala Leu Ser Ile Trp His Arg Glu | | | | | | | | | | | | | | | | | | |
| 355 360 365 | | | | | | | | | | | | | | | | | | |
| ctg ccg ccg agt ctt cat ttc acc gcc ccc aac ccg gaa atc ccg ctg | 1152 | | | | | | | | | | | | | | | | | |
| Leu Pro Pro Ser Leu His Phe Thr Ala Pro Asn Pro Glu Ile Pro Leu | | | | | | | | | | | | | | | | | | |
| 370 375 380 | | | | | | | | | | | | | | | | | | |
| gac gaa ttg aac cta cgc gtc cag cgt gat ctg cgg ccg tgg ccg gag | 1200 | | | | | | | | | | | | | | | | | |
| Asp Glu Leu Asn Leu Arg Val Gln Arg Asp Leu Arg Pro Trp Pro Glu | | | | | | | | | | | | | | | | | | |
| 385 390 395 400 | | | | | | | | | | | | | | | | | | |
| agc gag ggg ccg ctg ctg gcc ggc gtc agc gcc ttc gga atg gga ggc | 1248 | | | | | | | | | | | | | | | | | |
| Ser Glu Gly Pro Leu Leu Ala Gly Val Ser Ala Phe Gly Met Gly Gly | | | | | | | | | | | | | | | | | | |
| 405 410 415 | | | | | | | | | | | | | | | | | | |
| acg aac tgc cac ctg gtg ctc tcc ggc acg tcc cgg gtg gag cga cgg | 1296 | | | | | | | | | | | | | | | | | |
| Thr Asn Cys His Leu Val Leu Ser Gly Thr Ser Arg Val Glu Arg Arg | | | | | | | | | | | | | | | | | | |
| 420 425 430 | | | | | | | | | | | | | | | | | | |
| cgc agt gga ccc gct gag gcg acc atg ccg tgg gtc ttg tcg gcc aga | 1344 | | | | | | | | | | | | | | | | | |
| Arg Ser Gly Pro Ala Glu Ala Thr Met Pro Trp Val Leu Ser Ala Arg | | | | | | | | | | | | | | | | | | |
| 435 440 445 | | | | | | | | | | | | | | | | | | |
| aca ccg gtc gca ttg cgt gcg cag gcg gcg cgc ttg cac acg cac ctc | 1392 | | | | | | | | | | | | | | | | | |
| Thr Pro Val Ala Leu Arg Ala Gln Ala Ala Arg Leu His Thr His Leu | | | | | | | | | | | | | | | | | | |
| 450 455 460 | | | | | | | | | | | | | | | | | | |
| aat acg gcc ggt caa agt ccg ttg gac gtc gcc tac tca ctg gcg acc | 1440 | | | | | | | | | | | | | | | | | |
| Asn Thr Ala Gly Gln Ser Pro Leu Asp Val Ala Tyr Ser Leu Ala Thr | | | | | | | | | | | | | | | | | | |
| 465 470 475 480 | | | | | | | | | | | | | | | | | | |
| act cga tcc gcg ctg ccg cac cgg gcc gcg ctg gtc gcg gac gac gaa | 1488 | | | | | | | | | | | | | | | | | |
| Thr Arg Ser Ala Leu Pro His Arg Ala Ala Leu Val Ala Asp Asp Glu | | | | | | | | | | | | | | | | | | |
| 485 490 495 | | | | | | | | | | | | | | | | | | |
| ccg aaa ctg ctc gcc ggg ttg aag gcc ctc gct gac ggc gac gac gcg | 1536 | | | | | | | | | | | | | | | | | |
| Pro Lys Leu Leu Ala Gly Leu Lys Ala Leu Ala Asp Gly Asp Asp Ala | | | | | | | | | | | | | | | | | | |
| 500 505 510 | | | | | | | | | | | | | | | | | | |
| ccc acg ctg tgc cac ggc gcg act tcc ggc gag cgg gca gcg gtc ttc | 1584 | | | | | | | | | | | | | | | | | |
| Pro Thr Leu Cys His Gly Ala Thr Ser Gly Glu Arg Ala Ala Val Phe | | | | | | | | | | | | | | | | | | |
| 515 520 525 | | | | | | | | | | | | | | | | | | |
| gtc ttt ccc gga cag ggc agc cag tgg atc ggg atg ggt agg cag ctg | 1632 | | | | | | | | | | | | | | | | | |
| Val Phe Pro Gly Gln Gly Ser Gln Trp Ile Gly Met Gly Arg Gln Leu | | | | | | | | | | | | | | | | | | |
| 530 535 540 | | | | | | | | | | | | | | | | | | |
| ctc gaa acc tcc gag gtt ttc gcg gcg tcg atg tcg gac tgc gcc gac | 1680 | | | | | | | | | | | | | | | | | |
| Leu Glu Thr Ser Glu Val Phe Ala Ala Ser Met Ser Asp Cys Ala Asp | | | | | | | | | | | | | | | | | | |
| 545 550 555 560 | | | | | | | | | | | | | | | | | | |
| gca ttg gcg ccg cac ctg gat tgg tcc ctg ctg gat gtg ctg cgc aac | 1728 | | | | | | | | | | | | | | | | | |
| Ala Leu Ala Pro His Leu Asp Trp Ser Leu Leu Asp Val Leu Arg Asn | | | | | | | | | | | | | | | | | | |
| 565 570 575 | | | | | | | | | | | | | | | | | | |

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|-----------------------------------------------------------------|------|
| gcg gcc ggc gct gcg cac ctt gac cac gac gat gtc gtc cag ccc gcg | 1776 |
| Ala Ala Gly Ala Ala His Leu Asp His Asp Asp Val Val Gln Pro Ala | |
| 580 585 590 | |
| ctg ttc gcc atc atg gtc tcg ctc gcg gag ctc tgg cgt tcg tgg ggc | 1824 |
| Leu Phe Ala Ile Met Val Ser Leu Ala Glu Leu Trp Arg Ser Trp Gly | |
| 595 600 605 | |
| gtg cgt ccg gtg gcg gtc gtc ggg cac tcg cag ggg gag atc gcg gcg | 1872 |
| Val Arg Pro Val Ala Val Val Gly His Ser Gln Gly Glu Ile Ala Ala | |
| 610 615 620 | |
| gcc tgc gtc gcc ggg gcc ctg tcc gtc cgc gat gcc gcc agg gtg gtg | 1920 |
| Ala Cys Val Ala Gly Ala Leu Ser Val Arg Asp Ala Ala Arg Val Val | |
| 625 630 635 640 | |
| gcg gtg cgc agc agg ctt ctg acg gcg ctg gcc ggc agt ggc gcg atg | 1968 |
| Ala Val Arg Ser Arg Leu Leu Thr Ala Leu Ala Gly Ser Gly Ala Met | |
| 645 650 655 | |
| gcc tcg ttg cag cat ccc gcc gaa gag gtg cgg caa atc ctg ttg ccc | 2016 |
| Ala Ser Leu Gln His Pro Ala Glu Glu Val Arg Gln Ile Leu Leu Pro | |
| 660 665 670 | |
| tgg cgc gat cgg atc ggc gtg gcg ggg gtg aac gga ccg tcg tcg acc | 2064 |
| Trp Arg Asp Arg Ile Gly Val Ala Gly Val Asn Gly Pro Ser Ser Thr | |
| 675 680 685 | |
| ctg gtg tca ggg gac cgg gag gcg atg gcg gaa ctg ctg gcc gag tgc | 2112 |
| Leu Val Ser Gly Asp Arg Glu Ala Met Ala Glu Leu Leu Ala Glu Cys | |
| 690 695 700 | |
| gca gac cga gag ctc cgg atg cgc cgg att ccc gtt gaa tac gcc tcc | 2160 |
| Ala Asp Arg Glu Leu Arg Met Arg Arg Ile Pro Val Glu Tyr Ala Ser | |
| 705 710 715 720 | |
| cat tcg cct cac atc gag gtt gtc cgg gat gag ctg ctg ggg ctg ttg | 2208 |
| His Ser Pro His Ile Glu Val Val Arg Asp Glu Leu Leu Gly Leu Leu | |
| 725 730 735 | |
| gcg ccg gtc gaa ccc agg acg gga agc atc ccg atc tat tcg acg acg | 2256 |
| Ala Pro Val Glu Pro Arg Thr Gly Ser Ile Pro Ile Tyr Ser Thr Thr | |
| 740 745 750 | |
| acc ggg gac ctg ctg gac cgg ccg atg gac gcc gac tac tgg tac cgc | 2304 |
| Thr Gly Asp Leu Leu Asp Arg Pro Met Asp Ala Asp Tyr Trp Tyr Arg | |
| 755 760 765 | |
| aac ctt cgt caa ccg gtg ctg ttc gaa gcg gcc gtc gag gcc ctg ttg | 2352 |
| Asn Leu Arg Gln Pro Val Leu Phe Glu Ala Ala Val Glu Ala Leu Leu | |
| 770 775 780 | |
| aag cgg ggg tac gac gca ttc atc gag atc agc cca cac ccg gtg ctg | 2400 |
| Lys Arg Gly Tyr Asp Ala Phe Ile Glu Ile Ser Pro His Pro Val Leu | |
| 785 790 795 800 | |

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|-----------------------------------------------------------------|------|
| act gcg aac atc cag gaa acc gcc gtg cga gca ggg cgg gag gta gtg | 2448 |
| Thr Ala Asn Ile Gln Glu Thr Ala Val Arg Ala Gly Arg Glu Val Val | |
| 805 810 815 | |
| gcg ctc ggg aca ctc cgc cgc ggc gaa ggt ggc atg cgg cag gcg ctg | 2496 |
| Ala Leu Gly Thr Leu Arg Arg Gly Glu Gly Gly Met Arg Gln Ala Leu | |
| 820 825 830 | |
| acg tcg ctg gcc aga gca cac gta cac gga gtg gcc gcg gac tgg cac | 2544 |
| Thr Ser Leu Ala Arg Ala His Val His Gly Val Ala Ala Asp Trp His | |
| 835 840 845 | |
| gcg gtc ttc gcc ggt acc ggg gcg cag cgg gtc gac ctg ccg acg tac | 2592 |
| Ala Val Phe Ala Gly Thr Gly Ala Gln Arg Val Asp Leu Pro Thr Tyr | |
| 850 855 860 | |
| gcc ttt cag cga cag cgc tac tgg ctg gac gcg aag ctt ccc gac gtc | 2640 |
| Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ala Lys Leu Pro Asp Val | |
| 865 870 875 880 | |
| gcc atg ccc gag agc gac gtg tcg acg gcg ttg cgg gaa aag ctg cgg | 2688 |
| Ala Met Pro Glu Ser Asp Val Ser Thr Ala Leu Arg Glu Lys Leu Arg | |
| 885 890 895 | |
| tct tcg ccg agg gcg gac gtg gac tcg acg acc ctc acg atg atc cgg | 2736 |
| Ser Ser Pro Arg Ala Asp Val Asp Ser Thr Thr Leu Thr Met Ile Arg | |
| 900 905 910 | |
| gca cag gca gcc gtg gtc ctc ggc cac tcc gat ccg aaa gag gtg gac | 2784 |
| Ala Gln Ala Ala Val Val Leu Gly His Ser Asp Pro Lys Glu Val Asp | |
| 915 920 925 | |
| ccg gat cgg acg ttc aag gac ctg ggc ttc gat tcc tcg atg gtg gtc | 2832 |
| Pro Asp Arg Thr Phe Lys Asp Leu Gly Phe Asp Ser Ser Met Val Val | |
| 930 935 940 | |
| gag ctg tgc gac cgc cta aac gcc gcc aca ggt ctg cga ctc gca ccg | 2880 |
| Glu Leu Cys Asp Arg Leu Asn Ala Ala Thr Gly Leu Arg Leu Ala Pro | |
| 945 950 955 960 | |
| agc gtc gtt ttc gac tgt cct acg ccg gac aag ctc gcc cgc cag gta | 2928 |
| Ser Val Val Phe Asp Cys Pro Thr Pro Asp Lys Leu Ala Arg Gln Val | |
| 965 970 975 | |
| cgg acg ttg ttg ttg ggc gag ccg gct ccc atg acg tca cac cgg ccg | 2976 |
| Arg Thr Leu Leu Leu Gly Glu Pro Ala Pro Met Thr Ser His Arg Pro | |
| 980 985 990 | |
| gac tcc gat gcg gac gag cct atc gcc gtg atc ggg atg ggc tgt cgg | 3024 |
| Asp Ser Asp Ala Asp Glu Pro Ile Ala Val Ile Gly Met Gly Cys Arg | |
| 995 1000 1005 | |
| ttt ccg ggt ggg gtg tcc tcg ccc gag gag ttg tgg cag ttg gtc gcc | 3072 |
| Phe Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Gln Leu Val Ala | |
| 1010 1015 1020 | |
| gct ggg cgg gac gtc gtg tcc gag ttc ccg gct gac cga ggt tgg gac | 3120 |

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|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Ala | Gly | Arg | Asp | Val | Val | Ser | Glu | Phe | Pro | Ala | Asp | Arg | Gly | Trp | Asp | |
| 1025 | | | | | 1030 | | | | | 1035 | | | | | 1040 | |
| ctg | gag | cgt | gcg | ggg | aca | tcg | cac | gtg | cgc | gcc | ggc | ggg | ttc | ttg | cat | 3168 |
| Leu | Glu | Arg | Ala | Gly | Thr | Ser | His | Val | Arg | Ala | Gly | Gly | Phe | Leu | His | |
| | | | | 1045 | | | | | 1050 | | | | | 1055 | | |
| ggc | gcc | ccg | gat | ttt | gac | ccc | ggg | ttc | ttc | cgg | att | tcg | ccg | cgc | gag | 3216 |
| Gly | Ala | Pro | Asp | Phe | Asp | Pro | Gly | Phe | Phe | Arg | Ile | Ser | Pro | Arg | Glu | |
| | | | 1060 | | | | | 1065 | | | | | 1070 | | | |
| gcg | ttg | gcg | atg | gat | cca | cag | cag | cgg | ttg | ctg | ctg | gaa | atc | gcc | tgg | 3264 |
| Ala | Leu | Ala | Met | Asp | Pro | Gln | Gln | Arg | Leu | Leu | Leu | Glu | Ile | Ala | Trp | |
| | | 1075 | | | | | 1080 | | | | | | 1085 | | | |
| gaa | gca | gtc | gaa | cga | ggc | ggg | atc | aac | ccg | cag | cac | ctg | cac | gga | agt | 3312 |
| Glu | Ala | Val | Glu | Arg | Gly | Gly | Ile | Asn | Pro | Gln | His | Leu | His | Gly | Ser | |
| | | 1090 | | | | 1095 | | | | | 1100 | | | | | |
| caa | acc | ggg | gtc | ttc | gtc | ggc | gcg | acc | tcc | ctg | gac | tac | ggg | cca | cgc | 3360 |
| Gln | Thr | Gly | Val | Phe | Val | Gly | Ala | Thr | Ser | Leu | Asp | Tyr | Gly | Pro | Arg | |
| 1105 | | | | | 1110 | | | | | 1115 | | | | | 1120 | |
| ctg | cac | gaa | gcg | tcc | gag | gag | gcg | gcc | ggg | tac | gtg | ctc | acc | ggc | agc | 3408 |
| Leu | His | Glu | Ala | Ser | Glu | Glu | Ala | Ala | Gly | Tyr | Val | Leu | Thr | Gly | Ser | |
| | | | | 1125 | | | | | 1130 | | | | | 1135 | | |
| acc | acg | agt | gtg | gcg | tcg | ggt | cgg | gtt | gcg | tat | tcg | ttc | ggg | ttc | gag | 3456 |
| Thr | Thr | Ser | Val | Ala | Ser | Gly | Arg | Val | Ala | Tyr | Ser | Phe | Gly | Phe | Glu | |
| | | | 1140 | | | | | 1145 | | | | | 1150 | | | |
| ggc | cct | gcg | gtg | acg | gtg | gat | acg | gcg | tgt | tcg | tcg | tcg | ttg | gtg | gcc | 3504 |
| Gly | Pro | Ala | Val | Thr | Val | Asp | Thr | Ala | Cys | Ser | Ser | Ser | Leu | Val | Ala | |
| | | 1155 | | | | | 1160 | | | | | 1165 | | | | |
| ctg | cat | ttg | gcg | tgt | cag | tcg | ttg | cgt | tcg | ggt | gag | tgt | gat | ctg | gcg | 3552 |
| Leu | His | Leu | Ala | Cys | Gln | Ser | Leu | Arg | Ser | Gly | Glu | Cys | Asp | Leu | Ala | |
| | | 1170 | | | | 1175 | | | | 1180 | | | | | | |
| ttg | gcc | ggt | ggt | gtg | acc | gtg | atg | gcc | acg | ccg | ggg | atg | ttc | gtg | gag | 3600 |
| Leu | Ala | Gly | Gly | Val | Thr | Val | Met | Ala | Thr | Pro | Gly | Met | Phe | Val | Glu | |
| 1185 | | | | | 1190 | | | | | 1195 | | | | | 1200 | |
| ttt | tcg | cgg | cag | cgt | ggt | ttg | gcg | ccg | gat | ggg | cgg | tgc | aag | tcg | ttc | 3648 |
| Phe | Ser | Arg | Gln | Arg | Gly | Leu | Ala | Pro | Asp | Gly | Arg | Cys | Lys | Ser | Phe | |
| | | | 1205 | | | | | | 1210 | | | | | 1215 | | |
| gcg | gag | gcc | gcc | gac | ggc | acc | ggc | tgg | tcc | gag | ggt | gct | ggc | ctg | gtt | 3696 |
| Ala | Glu | Ala | Ala | Asp | Gly | Thr | Gly | Trp | Ser | Glu | Gly | Ala | Gly | Leu | Val | |
| | | 1220 | | | | | 1225 | | | | | 1230 | | | | |
| cta | ctg | gag | cgg | ttg | tcg | gat | gcc | cgg | cgg | aat | ggg | cat | gag | gtg | ct | |

| 1250 | 1255 | 1260 | |
|-----------------------------------------------------------------|------|------|------|
| ttg acc gcg ccg aat ggt tgc tgc cag cag cgg gtg att gcc cag gca | | | 3840 |
| Leu Thr Ala Pro Asn Gly Ser Ser Gln Gln Arg Val Ile Ala Gln Ala | | | |
| 1265 | 1270 | 1275 | 1280 |
| ttg gcg agt gcg ggg ttg tgc gtg tcc gat gtg gat gct gtg gag gcg | | | 3888 |
| Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp Ala Val Glu Ala | | | |
| 1285 | 1290 | 1295 | |
| cat ggg acg ggc acg cgg ctt ggt gat ccg atc gag gcg cag gcg ctg | | | 3936 |
| His Gly Thr Gly Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu | | | |
| 1300 | 1305 | 1310 | |
| atc gcc acc tac ggc cag ggc cgg ctt ccg gaa cgg cca ttg tgg ttg | | | 3984 |
| Ile Ala Thr Tyr Gly Gln Gly Arg Leu Pro Glu Arg Pro Leu Trp Leu | | | |
| 1315 | 1320 | 1325 | |
| ggc tgc atg aag tgc aac atc ggt cac gcg cag gca gct gcg ggg ata | | | 4032 |
| Gly Ser Met Lys Ser Asn Ile Gly His Ala Gln Ala Ala Ala Gly Ile | | | |
| 1330 | 1335 | 1340 | |
| gcc ggc gtc atg aag atg gtg atg gcg atg cgg cac ggg cag cta ccg | | | 4080 |
| Ala Gly Val Met Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro | | | |
| 1345 | 1350 | 1355 | 1360 |
| cgc acg ttg cac gtg gat gag ccg act tct ggg gtg gat tgg tgc gcg | | | 4128 |
| Arg Thr Leu His Val Asp Glu Pro Thr Ser Gly Val Asp Trp Ser Ala | | | |
| 1365 | 1370 | 1375 | |
| ggg acg gtt caa ctc ctt acg gag aac acg ccc tgg ccc ggg agt ggt | | | 4176 |
| Gly Thr Val Gln Leu Leu Thr Glu Asn Thr Pro Trp Pro Gly Ser Gly | | | |
| 1380 | 1385 | 1390 | |
| cgt gtt cgt cgg gtg ggg gtg tgc tgc ttc ggg atc agt ggt act aac | | | 4224 |
| Arg Val Arg Arg Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn | | | |
| 1395 | 1400 | 1405 | |
| gcg cac gtc atc ctc gaa cag ccc ccg gga gtg ccg agt cag tct gcg | | | 4272 |
| Ala His Val Ile Leu Glu Gln Pro Pro Gly Val Pro Ser Gln Ser Ala | | | |
| 1410 | 1415 | 1420 | |
| ggg ccg ggt tgc ggc tct gtc gtg gat gtt ccg gtg gtg ccg tgg atg | | | 4320 |
| Gly Pro Gly Ser Gly Ser Val Val Asp Val Pro Val Val Pro Trp Met | | | |
| 1425 | 1430 | 1435 | 1440 |
| gtg tgc ggc aaa aca ccc gaa gcg cta tcc gcg cag gca acg gcg ttg | | | 4368 |
| Val Ser Gly Lys Thr Pro Glu Ala Leu Ser Ala Gln Ala Thr Ala Leu | | | |
| 1445 | 1450 | 1455 | |
| atg acc tat ctg gac gag cga cct gat gtc tcc tgc ctg gat gtt ggg | | | 4416 |
| Met Thr Tyr Leu Asp Glu Arg Pro Asp Val Ser Ser Leu Asp Val Gly | | | |
| 1460 | 1465 | 1470 | |
| tac tgc ctg gcg ttg aca cgg tgc gcg ctg gat gag cga gcg gtg gtg | | | 4464 |
| Tyr Ser Leu Ala Leu Thr Arg Ser Ala Leu Asp Glu Arg Ala Val Val | | | |
| 1475 | 1480 | 1485 | |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| ctg ggg tcg gac cgt gaa acg ttg ttg tgc ggt gtg aaa gcg ctg tct Leu Gly Ser Asp Arg Glu Thr Leu Leu Cys Gly Val Lys Ala Leu Ser 1490 1495 1500 | 4512 |
| gcc ggt cat gag gct tct ggg ttg gtg acc gga tct gtg ggg gct ggg Ala Gly His Glu Ala Ser Gly Leu Val Thr Gly Ser Val Gly Ala Gly 1505 1510 1515 1520 | 4560 |
| ggc cgc atc ggg ttt gtg ttt tcc ggt cag ggt ggt cag tgg ctg ggg Gly Arg Ile Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly 1525 1530 1535 | 4608 |
| atg ggc cgg ggg ctt tac cgg gct ttt ccg gtg ttc gct gct gcc ttt Met Gly Arg Gly Leu Tyr Arg Ala Phe Pro Val Phe Ala Ala Ala Phe 1540 1545 1550 | 4656 |
| gac gaa gct tgt gcc gag ctg gat gcg cat ctg ggc cag gaa atc ggg Asp Glu Ala Cys Ala Glu Leu Asp Ala His Leu Gly Gln Glu Ile Gly 1555 1560 1565 | 4704 |
| gtt cgg gag gtg gtg tcc ggt tcg gat gcg cag ttg ctg gat cgg acg Val Arg Glu Val Val Ser Gly Ser Asp Ala Gln Leu Leu Asp Arg Thr 1570 1575 1580 | 4752 |
| ttg tgg gcg cag tcg ggt ttg ttc gcg ttg cag gtg ggc ttg ctg aag Leu Trp Ala Gln Ser Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Lys 1585 1590 1595 1600 | 4800 |
| ttg ctg gat tcg tgg ggg gtt cgg ccg agt gtg gtg ttg ggg cat tcg Leu Leu Asp Ser Trp Gly Val Arg Pro Ser Val Val Leu Gly His Ser 1605 1610 1615 | 4848 |
| gtg ggc gag ttg gcg gcg gcg ttc gcg gcg ggt gtg gtg tcg ttg tcg Val Gly Glu Leu Ala Ala Ala Phe Ala Ala Gly Val Val Ser Leu Ser 1620 1625 1630 | 4896 |
| ggg gcg gct cgg ttg gtg gcg ggt cgt gcc cgg ttg atg cag gcg ttg Gly Ala Ala Arg Leu Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu 1635 1640 1645 | 4944 |
| ccg tct ggc ggt ggg atg ctg gcg gtg cct gct ggt gag gag ctg ttg Pro Ser Gly Gly Gly Met Leu Ala Val Pro Ala Gly Glu Glu Leu Leu 1650 1655 1660 | 4992 |
| tgg tcg ttg ttg gcc gat cag ggt gat cgt gtg ggg atc gcc gcg gtc Trp Ser Leu Leu Ala Asp Gln Gly Asp Arg Val Gly Ile Ala Ala Val 1665 1670 1675 1680 | 5040 |
| aac gct gcg ggg tcg gtg gtg ctc tct ggt gat cgg gat gtg ctc gat Asn Ala Ala Gly Ser Val Val Leu Ser Gly Asp Arg Asp Val Leu Asp 1685 1690 1695 | 5088 |
| gac ctt gcc ggt cgg ctg gac ggg caa ggg atc cgg tcg agg tgg ttg Asp Leu Ala Gly Arg Leu Asp Gly Gln Gly Ile Arg Ser Arg Trp Leu 1700 1705 1710 | 5136 |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| cgg gtg tcg cat gcg ttt cat tcg tat cgg atg gat ccg atg ctg gcg Arg Val Ser His Ala Phe His Ser Tyr Arg Met Asp Pro Met Leu Ala 1715 1720 1725 | 5184 |
| gag ttc gcc gaa ttg gca cga acc gtg gat tac cgg cgt tgt gaa gtg Glu Phe Ala Glu Leu Ala Arg Thr Val Asp Tyr Arg Arg Cys Glu Val 1730 1735 1740 | 5232 |
| ccg atc gtg tcg acc ttg acc gga gac ctc gat gac gct ggc agg atg Pro Ile Val Ser Thr Leu Thr Gly Asp Leu Asp Asp Ala Gly Arg Met 1745 1750 1755 1760 | 5280 |
| agc ggg ccc gac tac tgg gtg cgt cag gtg cga gag ccg gtc cgc ttc Ser Gly Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe 1765 1770 1775 | 5328 |
| gcc gac ggt gtc cag gcg ctg gtc gag cac gat gtg gcc acc gtt gtc Ala Asp Gly Val Gln Ala Leu Val Glu His Asp Val Ala Thr Val Val 1780 1785 1790 | 5376 |
| gag ctc ggt ccg gac ggg gcg ttg tcg gcg ctg atc cag gaa tgt gtc Glu Leu Gly Pro Asp Gly Ala Leu Ser Ala Leu Ile Gln Glu Cys Val 1795 1800 1805 | 5424 |
| gcc gca tcc gat cac gcc ggg cgg ctg agc gcg gtc ccg gcg atg cgc Ala Ala Ser Asp His Ala Gly Arg Leu Ser Ala Val Pro Ala Met Arg 1810 1815 1820 | 5472 |
| agg aac cag gac gag gcg cag aag gtg atg acg gcc ctg gca cac gtc Arg Asn Gln Asp Glu Ala Gln Lys Val Met Thr Ala Leu Ala His Val 1825 1830 1835 1840 | 5520 |
| cac gta cgt ggt ggt gcg gtg gac tgg cgg tcg ttc ttc gcc ggt aca His Val Arg Gly Gly Ala Val Asp Trp Arg Ser Phe Phe Ala Gly Thr 1845 1850 1855 | 5568 |
| agg gcg aag caa atc gag ctg ccc acc tac gcc ttc caa cga cag cgg Arg Ala Lys Gln Ile Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg 1860 1865 1870 | 5616 |
| tac tgg ctg aac gcg ctg cgt gaa tct tcc gcc ggc gac atg ggc agg Tyr Trp Leu Asn Ala Leu Arg Glu Ser Ser Ala Gly Asp Met Gly Arg 1875 1880 1885 | 5664 |
| cgt gtc gaa gcg aag ttc tgg ggc gcc gtc gag cac gaa gat gtg gaa Arg Val Glu Ala Lys Phe Trp Gly Ala Val Glu His Glu Asp Val Glu 1890 1895 1900 | 5712 |
| tcg ctt gca cgc gta ttg ggc att gtg gac gac ggc gct gct gtg gat Ser Leu Ala Arg Val Leu Gly Ile Val Asp Asp Gly Ala Ala Val Asp 1905 1910 1915 1920 | 5760 |
| tcc ctg aga agc gcc ctt ccg gtg ttg gcc ggt tgg cag cga acc cgc Ser Leu Arg Ser Ala Leu Pro Val Leu Ala Gly Trp Gln Arg Thr Arg 1925 1930 1935 | 5808 |
| acc acc gag tcc att atg gat cag cgg tgt tac cga att ggc tgg cgg | 5856 |

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|-----------------------------------------------------------------|------|
| Thr Thr Glu Ser Ile Met Asp Gln Arg Cys Tyr Arg Ile Gly Trp Arg | |
| 1940 1945 1950 | |
| cag gta gcc gga ctc ccg ccg atg gga act gtt ttc ggt acc tgg ctg | 5904 |
| Gln Val Ala Gly Leu Pro Pro Met Gly Thr Val Phe Gly Thr Trp Leu | |
| 1955 1960 1965 | |
| gtc ttc gcg cct cat ggc tgg tcc agc gaa ccg gag gtg gtg gac tgc | 5952 |
| Val Phe Ala Pro His Gly Trp Ser Ser Glu Pro Glu Val Val Asp Cys | |
| 1970 1975 1980 | |
| gtt acg gca ctg cgg gca cgt ggt gcc tcg gtg gtg ttg gtg gaa gct | 6000 |
| Val Thr Ala Leu Arg Ala Arg Gly Ala Ser Val Val Leu Val Glu Ala | |
| 1985 1990 1995 2000 | |
| gat ccc gac ccg acc tcc ttc ggc gac ccg gta cga acc ctg tgt tcg | 6048 |
| Asp Pro Asp Pro Thr Ser Phe Gly Asp Arg Val Arg Thr Leu Cys Ser | |
| 2005 2010 2015 | |
| ggc ctt ccg gat ctt gtt ggc gtg ttg tca atg ttg tgc ttg gaa gaa | 6096 |
| Gly Leu Pro Asp Leu Val Gly Val Leu Ser Met Leu Cys Leu Glu Glu | |
| 2020 2025 2030 | |
| tcg gtc ctt ccg gga ttt tct gcg gtg tca ccg ggt ttt gcg ttg acc | 6144 |
| Ser Val Leu Pro Gly Phe Ser Ala Val Ser Arg Gly Phe Ala Leu Thr | |
| 2035 2040 2045 | |
| gtg gag ttg gtg cgg gtt ttg cgg gca gct ggt gcg act gcc cgg ttg | 6192 |
| Val Glu Leu Val Arg Val Leu Arg Ala Ala Gly Ala Thr Ala Arg Leu | |
| 2050 2055 2060 | |
| tgg ttg ctg acg tgt ggt ggc gtg tcg gtg gga gat gta ccg gtt cgt | 6240 |
| Trp Leu Leu Thr Cys Gly Gly Val Ser Val Gly Asp Val Pro Val Arg | |
| 2065 2070 2075 2080 | |
| cca gcg cag gcc ctg gcg tgg ggg ttg ggg cgt gtt gtg ggg ttg gag | 6288 |
| Pro Ala Gln Ala Leu Ala Trp Gly Leu Gly Arg Val Val Gly Leu Glu | |
| 2085 2090 2095 | |
| cat ccg gac tgg tgg ggc ggc ttg atc gat att ccg gtc ttg ttc gac | 6336 |
| His Pro Asp Trp Trp Gly Gly Leu Ile Asp Ile Pro Val Leu Phe Asp | |
| 2100 2105 2110 | |
| gaa gac gct caa gag cgg ttg tcg att gtg ctg gca ggt ctc gat gag | 6384 |
| Glu Asp Ala Gln Glu Arg Leu Ser Ile Val Leu Ala Gly Leu Asp Glu | |
| 2115 2120 2125 | |
| gac gag gtc gcg atc cgt cct gac ggc atg ttc gcg cgt cgg ttg gta | 6432 |
| Asp Glu Val Ala Ile Arg Pro Asp Gly Met Phe Ala Arg Arg Leu Val | |
| 2130 2135 2140 | |
| cgc cac act gtc tca gct gat gtg aag aag gcg tgg cgc ccc agg gga | 6480 |
| Arg His Thr Val Ser Ala Asp Val Lys Lys Ala Trp Arg Pro Arg Gly | |
| 2145 2150 2155 2160 | |
| tcg gtg ctg gtg acg ggc ggc acg ggt ggt ttg ggg gcg cac gtt gct | 6528 |
| Ser Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala | |

| 2165 | 2170 | 2175 | |
|-----------------------------------------------------------------|------|------|------|
| cgc tgg ctg gcc gac gcc gga gcc gaa cat gtg gcg atg gtg agt cga | | | 6576 |
| Arg Trp Leu Ala Asp Ala Gly Ala Glu His Val Ala Met Val Ser Arg | | | |
| 2180 | 2185 | 2190 | |
| cgc ggc gag cag gca ccg agt gct gag aag ttg cgg acg gaa ctg gag | | | 6624 |
| Arg Gly Glu Gln Ala Pro Ser Ala Glu Lys Leu Arg Thr Glu Leu Glu | | | |
| 2195 | 2200 | 2205 | |
| gat ctg ggt acc cgg gtg tcg atc gtg tca tgc gat gtg acc gat cgc | | | 6672 |
| Asp Leu Gly Thr Arg Val Ser Ile Val Ser Cys Asp Val Thr Asp Arg | | | |
| 2210 | 2215 | 2220 | |
| gag gcg ctc gcc gaa gtg ctg aaa gcc ctt ccg gct gaa aac ccg ttg | | | 6720 |
| Glu Ala Leu Ala Glu Val Leu Lys Ala Leu Pro Ala Glu Asn Pro Leu | | | |
| 2225 | 2230 | 2235 | 2240 |
| acc gcg gta gtg cat gcg gca ggc gtg atc gag act ggt gat gcg gcg | | | 6768 |
| Thr Ala Val Val His Ala Ala Gly Val Ile Glu Thr Gly Asp Ala Ala | | | |
| 2245 | 2250 | 2255 | |
| gca atg agc ctg gct gat ttc gat cac gtg ttg tcc gca aag gtg gcc | | | 6816 |
| Ala Met Ser Leu Ala Asp Phe Asp His Val Leu Ser Ala Lys Val Ala | | | |
| 2260 | 2265 | 2270 | |
| ggt gcc gcg aat ctg gat gcc ttg ttg gcc gat gtg gaa ttg gac gcg | | | 6864 |
| Gly Ala Ala Asn Leu Asp Ala Leu Leu Ala Asp Val Glu Leu Asp Ala | | | |
| 2275 | 2280 | 2285 | |
| ttc gtc ttg ttc tca tcg gtg tca gga gtt tgg ggc gct ggg gga cac | | | 6912 |
| Phe Val Leu Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly His | | | |
| 2290 | 2295 | 2300 | |
| ggg gct tac gca gcg gcg aat gcc tat ctg gat gcg ctc gcg gaa cag | | | 6960 |
| Gly Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln | | | |
| 2305 | 2310 | 2315 | 2320 |
| cgt cgg tcg cga ggg ctg gtc gcg act gcg gtg gcc tgg ggg ccg tgg | | | 7008 |
| Arg Arg Ser Arg Gly Leu Val Ala Thr Ala Val Ala Trp Gly Pro Trp | | | |
| 2325 | 2330 | 2335 | |
| gcc ggc gag ggc atg gcc tcc gga gaa aca gga gac cag ctg cgc cga | | | 7056 |
| Ala Gly Glu Gly Met Ala Ser Gly Glu Thr Gly Asp Gln Leu Arg Arg | | | |
| 2340 | 2345 | 2350 | |
| tac ggc ctt tcc cca atg gct ccg cag cac gcc atc gcc gga atc ccg | | | 7104 |
| Tyr Gly Leu Ser Pro Met Ala Pro Gln His Ala Ile Ala Gly Ile Arg | | | |
| 2355 | 2360 | 2365 | |
| cag gcc gtg gaa cag gac gaa att tcc ctg gta gtg gcc gat gtc gat | | | 7152 |
| Gln Ala Val Glu Gln Asp Glu Ile Ser Leu Val Val Ala Asp Val Asp | | | |
| 2370 | 2375 | 2380 | |
| tgg gca cgt ttc agc gcg gga ttg ctg gcg gct agg ccg ccg ccg ctg | | | 7200 |
| Trp Ala Arg Phe Ser Ala Gly Leu Leu Ala Ala Arg Pro Arg Pro Leu | | | |
| 2385 | 2390 | 2395 | 2400 |

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| ctg aac gaa ctg gcc gag gtc aag gaa ctc ctc gtc gat gcc cag ccc Leu Asn Glu Leu Ala Glu Val Lys Glu Leu Leu Val Asp Ala Gln Pro 2405 2410 2415 | 7248 |
| gag gcg gga gtc ctt gcc gac gcg tcg ttg gaa tgg cgg cag cga ttg Glu Ala Gly Val Leu Ala Asp Ala Ser Leu Glu Trp Arg Gln Arg Leu 2420 2425 2430 | 7296 |
| tcc gcg gca ccg agg ccg aca cag gaa cag ctg atc ctg gag ctg gta Ser Ala Ala Pro Arg Pro Thr Gln Glu Gln Leu Ile Leu Glu Leu Val 2435 2440 2445 | 7344 |
| cgc ggc gaa acc gct ctg gtg ctg gga cac ccc ggg gca gcg gcc gtt Arg Gly Glu Thr Ala Leu Val Leu Gly His Pro Gly Ala Ala Ala Val 2450 2455 2460 | 7392 |
| gca tcg gaa cga gcc ttc aag gac agc gga ttc gac tcg cag gcc gcg Ala Ser Glu Arg Ala Phe Lys Asp Ser Gly Phe Asp Ser Gln Ala Ala 2465 2470 2475 2480 | 7440 |
| gtc gaa ctc cgc gtt cgg ctc aat cga gct acc ggc ctc cag ttg cca Val Glu Leu Arg Val Arg Leu Asn Arg Ala Thr Gly Leu Gln Leu Pro 2485 2490 2495 | 7488 |
| tcg aca att atc ttc agc cat ccc acg cct gcg gaa ctg gct gcg gag Ser Thr Ile Ile Phe Ser His Pro Thr Pro Ala Glu Leu Ala Ala Glu 2500 2505 2510 | 7536 |
| ctg cgg gcg agg ctt ctt ccc gag tcc gca gga gca ggc att ccc gag Leu Arg Ala Arg Leu Leu Pro Glu Ser Ala Gly Ala Gly Ile Pro Glu 2515 2520 2525 | 7584 |
| gag gac gag gcg cga atc aga gcg gca ctg acg tcg atc ccg ttc ccg Glu Asp Glu Ala Arg Ile Arg Ala Ala Leu Thr Ser Ile Pro Phe Pro 2530 2535 2540 | 7632 |
| gcc ttg cgc gag gca ggc ttg gtg agt ccg ctg ctc gca ctt gcc gga Ala Leu Arg Glu Ala Gly Leu Val Ser Pro Leu Leu Ala Leu Ala Gly 2545 2550 2555 2560 | 7680 |
| cac ccg gtc gac tcc ggt atc tcc tcg gac gat gcg gcc gcg acc tcg His Pro Val Asp Ser Gly Ile Ser Ser Asp Asp Ala Ala Ala Thr Ser 2565 2570 2575 | 7728 |
| atc gat gcg atg gat gta gcc ggc ctc gtc gaa gca gcg ctg ggc gaa Ile Asp Ala Met Asp Val Ala Gly Leu Val Glu Ala Ala Leu Gly Glu 2580 2585 2590 | 7776 |
| cgc gag tcc tga Arg Glu Ser 2595 | 7788 |

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<211> 2595
<212> PRT

<213> Saccharopolyspora spinosa

<400> 42

| | | | | | | | | | | | | | | | |
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| Met | Ser | Glu | Ala | Gly | Asn | Leu | Ile | Ala | Val | Ile | Gly | Leu | Ser | Cys | Arg |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Leu | Pro | Gln | Ala | Pro | Asp | Pro | Ala | Ser | Phe | Trp | Arg | Leu | Leu | Arg | Thr |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Thr | Asp | Ala | Ile | Thr | Thr | Val | Pro | Glu | Gly | Arg | Trp | Gly | Asp | Pro |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Leu | Pro | Gly | Arg | Asp | Ala | Pro | Lys | Gly | Pro | Glu | Trp | Gly | Gly | Phe | Leu |
| | | 50 | | | | | 55 | | | | 60 | | | | |
| Ala | Asp | Val | Asp | Cys | Phe | Asp | Pro | Glu | Phe | Phe | Gly | Ile | Ser | Pro | Arg |
| | 65 | | | | | 70 | | | | 75 | | | | | 80 |
| Glu | Ala | Ala | Ala | Val | Asp | Pro | Gln | Gln | Arg | Leu | Ala | Leu | Glu | Leu | Ala |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Trp | Glu | Ala | Leu | Glu | Asp | Ala | Gly | Ile | Pro | Ala | Gly | Glu | Leu | Arg | Gly |
| | | | 100 | | | | | 105 | | | | | | 110 | |
| Thr | Ala | Ala | Gly | Val | Phe | Met | Gly | Ala | Ile | Ser | Asp | Asp | Tyr | Ala | Ala |
| | | | 115 | | | | | 120 | | | | | 125 | | |
| Leu | Leu | Arg | Glu | Ser | Pro | Pro | Glu | Val | Ala | Ala | Gln | Tyr | Arg | Leu | Thr |
| | | | 130 | | | | | 135 | | | | 140 | | | |
| Gly | Thr | His | Arg | Ser | Leu | Ile | Ala | Asn | Arg | Val | Ser | Tyr | Val | Leu | Gly |
| | | | | | 150 | | | | | 155 | | | | | 160 |
| Leu | Arg | Gly | Pro | Ser | Leu | Thr | Val | Asp | Ser | Gly | Gln | Ser | Ser | Ser | Leu |
| | | | | | 165 | | | | | 170 | | | | | 175 |
| Val | Gly | Val | His | Leu | Ala | Ser | Glu | Ser | Leu | Arg | Arg | Gly | Glu | Cys | Thr |
| | | | | | 180 | | | | | 185 | | | | 190 | |
| Ile | Ala | Leu | Ala | Gly | Gly | Val | Asn | Leu | Asn | Leu | Ala | Ala | Glu | Ser | Asn |
| | | | | | | | 200 | | | | | | 205 | | |
| Ser | Ala | Leu | Met | Asp | Phe | Gly | Ala | Leu | Ser | Pro | Asp | Gly | Arg | Cys | Phe |
| | | | 210 | | | | 215 | | | | | 220 | | | |
| Thr | Phe | Asp | Val | Arg | Ala | Asn | Gly | Tyr | Val | Arg | Gly | Glu | Gly | Gly | Gly |
| | | | | | 230 | | | | | 235 | | | | | 240 |
| Leu | Val | Val | Leu | Lys | Lys | Ala | Asp | Gln | Ala | His | Ala | Asp | Gly | Asp | Arg |
| | | | | | 245 | | | | | 250 | | | | 255 | |
| Ile | Tyr | Cys | Leu | Ile | Arg | Gly | Ser | Ala | Val | Asn | Asn | Asp | Gly | Gly | Gly |
| | | | | | 260 | | | | | 265 | | | | 270 | |
| Ala | Gly | Leu | Thr | Val | Pro | Ala | Ala | Asp | Ala | Gln | Ala | Glu | Leu | Leu | Arg |
| | | | | | | | 280 | | | | | | 285 | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Ala | Tyr | Arg | Asn | Ala | Gly | Val | Asp | Pro | Ala | Ala | Val | Gln | Tyr | Val | 290 | 295 | 300 | |
| Glu | Leu | His | Gly | Ser | Ala | Thr | Arg | Val | Gly | Asp | Pro | Val | Glu | Ala | Ala | 305 | 310 | 315 | 320 |
| Ala | Leu | Gly | Ala | Val | Leu | Gly | Ala | Ala | Arg | Arg | Pro | Gly | Asp | Glu | Leu | 325 | 330 | 335 | |
| Arg | Val | Gly | Ser | Ala | Lys | Thr | Asn | Val | Gly | His | Leu | Glu | Ala | Ala | Ala | 340 | 345 | 350 | |
| Gly | Val | Thr | Gly | Leu | Leu | Lys | Thr | Ala | Leu | Ser | Ile | Trp | His | Arg | Glu | 355 | 360 | 365 | |
| Leu | Pro | Pro | Ser | Leu | His | Phe | Thr | Ala | Pro | Asn | Pro | Glu | Ile | Pro | Leu | 370 | 375 | 380 | |
| Asp | Glu | Leu | Asn | Leu | Arg | Val | Gln | Arg | Asp | Leu | Arg | Pro | Trp | Pro | Glu | 385 | 390 | 395 | 400 |
| Ser | Glu | Gly | Pro | Leu | Leu | Ala | Gly | Val | Ser | Ala | Phe | Gly | Met | Gly | Gly | 405 | 410 | 415 | |
| Thr | Asn | Cys | His | Leu | Val | Leu | Ser | Gly | Thr | Ser | Arg | Val | Glu | Arg | Arg | 420 | 425 | 430 | |
| Arg | Ser | Gly | Pro | Ala | Glu | Ala | Thr | Met | Pro | Trp | Val | Leu | Ser | Ala | Arg | 435 | 440 | 445 | |
| Thr | Pro | Val | Ala | Leu | Arg | Ala | Gln | Ala | Ala | Arg | Leu | His | Thr | His | Leu | 450 | 455 | 460 | |
| Asn | Thr | Ala | Gly | Gln | Ser | Pro | Leu | Asp | Val | Ala | Tyr | Ser | Leu | Ala | Thr | 465 | 470 | 475 | 480 |
| Thr | Arg | Ser | Ala | Leu | Pro | His | Arg | Ala | Ala | Leu | Val | Ala | Asp | Asp | Glu | 485 | 490 | 495 | |
| Pro | Lys | Leu | Leu | Ala | Gly | Leu | Lys | Ala | Leu | Ala | Asp | Gly | Asp | Asp | Ala | 500 | 505 | 510 | |
| Pro | Thr | Leu | Cys | His | Gly | Ala | Thr | Ser | Gly | Glu | Arg | Ala | Ala | Val | Phe | 515 | 520 | 525 | |
| Val | Phe | Pro | Gly | Gln | Gly | Ser | Gln | Trp | Ile | Gly | Met | Gly | Arg | Gln | Leu | 530 | 535 | 540 | |
| Leu | Glu | Thr | Ser | Glu | Val | Phe | Ala | Ala | Ser | Met | Ser | Asp | Cys | Ala | Asp | 545 | 550 | 555 | 560 |
| Ala | Leu | Ala | Pro | His | Leu | Asp | Trp | Ser | Leu | Leu | Asp | Val | Leu | Arg | Asn | 565 | 570 | 575 | |
| Ala | Ala | Gly | Ala | Ala | His | Leu | Asp | His | Asp | Asp | Val | Val | Gln | Pro | Ala | 580 | 585 | 590 | |

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Phe | Ala | Ile | Met | Val | Ser | Leu | Ala | Glu | Leu | Trp | Arg | Ser | Trp | Gly | 595 | 600 | 605 |
| Val | Arg | Pro | Val | Ala | Val | Val | Gly | His | Ser | Gln | Gly | Glu | Ile | Ala | Ala | 610 | 615 | 620 |
| Ala | Cys | Val | Ala | Gly | Ala | Leu | Ser | Val | Arg | Asp | Ala | Ala | Arg | Val | Val | 625 | 630 | 635 |
| Ala | Val | Arg | Ser | Arg | Leu | Leu | Thr | Ala | Leu | Ala | Gly | Ser | Gly | Ala | Met | 645 | 650 | 655 |
| Ala | Ser | Leu | Gln | His | Pro | Ala | Glu | Glu | Val | Arg | Gln | Ile | Leu | Leu | Pro | 660 | 665 | 670 |
| Trp | Arg | Asp | Arg | Ile | Gly | Val | Ala | Gly | Val | Asn | Gly | Pro | Ser | Ser | Thr | 675 | 680 | 685 |
| Leu | Val | Ser | Gly | Asp | Arg | Glu | Ala | Met | Ala | Glu | Leu | Leu | Ala | Glu | Cys | 690 | 695 | 700 |
| Ala | Asp | Arg | Glu | Leu | Arg | Met | Arg | Arg | Ile | Pro | Val | Glu | Tyr | Ala | Ser | 705 | 710 | 715 |
| His | Ser | Pro | His | Ile | Glu | Val | Val | Arg | Asp | Glu | Leu | Leu | Gly | Leu | Leu | 725 | 730 | 735 |
| Ala | Pro | Val | Glu | Pro | Arg | Thr | Gly | Ser | Ile | Pro | Ile | Tyr | Ser | Thr | Thr | 740 | 745 | 750 |
| Thr | Gly | Asp | Leu | Leu | Asp | Arg | Pro | Met | Asp | Ala | Asp | Tyr | Trp | Tyr | Arg | 755 | 760 | 765 |
| Asn | Leu | Arg | Gln | Pro | Val | Leu | Phe | Glu | Ala | Ala | Val | Glu | Ala | Leu | Leu | 770 | 775 | 780 |
| Lys | Arg | Gly | Tyr | Asp | Ala | Phe | Ile | Glu | Ile | Ser | Pro | His | Pro | Val | Leu | 785 | 790 | 795 |
| Thr | Ala | Asn | Ile | Gln | Glu | Thr | Ala | Val | Arg | Ala | Gly | Arg | Glu | Val | Val | 805 | 810 | 815 |
| Ala | Leu | Gly | Thr | Leu | Arg | Arg | Gly | Glu | Gly | Gly | Met | Arg | Gln | Ala | Leu | 820 | 825 | 830 |
| Thr | Ser | Leu | Ala | Arg | Ala | His | Val | His | Gly | Val | Ala | Ala | Asp | Trp | His | 835 | 840 | 845 |
| Ala | Val | Phe | Ala | Gly | Thr | Gly | Ala | Gln | Arg | Val | Asp | Leu | Pro | Thr | Tyr | 850 | 855 | 860 |
| Ala | Phe | Gln | Arg | Gln | Arg | Tyr | Trp | Leu | Asp | Ala | Lys | Leu | Pro | Asp | Val | 865 | 870 | 875 |
| Ala | Met | Pro | Glu | Ser | Asp | Val | Ser | Thr | Ala | Leu | Arg | Glu | Lys | Leu | Arg | 885 | 890 | 895 |

| | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|--|--|--|
| Ser | Ser | Pro | Arg | Ala | Asp | Val | Asp | Ser | Thr | Thr | Leu | Thr | Met | Ile | Arg | | | |
| | | | 900 | | | | | 905 | | | | | 910 | | | | | |
| Ala | Gln | Ala | Ala | Val | Val | Leu | Gly | His | Ser | Asp | Pro | Lys | Glu | Val | Asp | | | |
| | | 915 | | | | | 920 | | | | | 925 | | | | | | |
| Pro | Asp | Arg | Thr | Phe | Lys | Asp | Leu | Gly | Phe | Asp | Ser | Ser | Met | Val | Val | | | |
| | 930 | | | | | 935 | | | | | 940 | | | | | | | |
| Glu | Leu | Cys | Asp | Arg | Leu | Asn | Ala | Ala | Thr | Gly | Leu | Arg | Leu | Ala | Pro | | | |
| 945 | | | | | 950 | | | | | 955 | | | | | 960 | | | |
| Ser | Val | Val | Phe | Asp | Cys | Pro | Thr | Pro | Asp | Lys | Leu | Ala | Arg | Gln | Val | | | |
| | | | | 965 | | | | | 970 | | | | | 975 | | | | |
| Arg | Thr | Leu | Leu | Leu | Gly | Glu | Pro | Ala | Pro | Met | Thr | Ser | His | Arg | Pro | | | |
| | | | 980 | | | | | 985 | | | | | 990 | | | | | |
| Asp | Ser | Asp | Ala | Asp | Glu | Pro | Ile | Ala | Val | Ile | Gly | Met | Gly | Cys | Arg | | | |
| | | 995 | | | | 1000 | | | | | | 1005 | | | | | | |
| Phe | Pro | Gly | Gly | Val | Ser | Ser | Pro | Glu | Glu | Leu | Trp | Gln | Leu | Val | Ala | | | |
| | 1010 | | | | | 1015 | | | | 1020 | | | | | | | | |
| Ala | Gly | Arg | Asp | Val | Val | Ser | Glu | Phe | Pro | Ala | Asp | Arg | Gly | Trp | Asp | | | |
| 1025 | | | | 1030 | | | | | 1035 | | | | | 1040 | | | | |
| Leu | Glu | Arg | Ala | Gly | Thr | Ser | His | Val | Arg | Ala | Gly | Gly | Phe | Leu | His | | | |
| | | | 1045 | | | | | 1050 | | | | | 1055 | | | | | |
| Gly | Ala | Pro | Asp | Phe | Asp | Pro | Gly | Phe | Phe | Arg | Ile | Ser | Pro | Arg | Glu | | | |
| | | 1060 | | | | | 1065 | | | | | 1070 | | | | | | |
| Ala | Leu | Ala | Met | Asp | Pro | Gln | Gln | Arg | Leu | Leu | Leu | Glu | Ile | Ala | Trp | | | |
| | 1075 | | | | | 1080 | | | | | | 1085 | | | | | | |
| Glu | Ala | Val | Glu | Arg | Gly | Gly | Ile | Asn | Pro | Gln | His | Leu | His | Gly | Ser | | | |
| | 1090 | | | | | 1095 | | | | | 1100 | | | | | | | |
| Gln | Thr | Gly | Val | Phe | Val | Gly | Ala | Thr | Ser | Leu | Asp | Tyr | Gly | Pro | Arg | | | |
| 1105 | | | | 1110 | | | | | 1115 | | | | | 1120 | | | | |
| Leu | His | Glu | Ala | Ser | Glu | Glu | Ala | Ala | Gly | Tyr | Val | Leu | Thr | Gly | Ser | | | |
| | | | 1125 | | | | | 1130 | | | | 1135 | | | | | | |
| Thr | Thr | Ser | Val | Ala | Ser | Gly | Arg | Val | Ala | Tyr | Ser | Phe | Gly | Phe | Glu | | | |
| | | 1140 | | | | | 1145 | | | | | 1150 | | | | | | |
| Gly | Pro | Ala | Val | Thr | Val | Asp | Thr | Ala | Cys | Ser | Ser | Ser | Leu | Val | Ala | | | |
| | 1155 | | | | | 1160 | | | | | 1165 | | | | | | | |
| Leu | His | Leu | Ala | Cys | Gln | Ser | Leu | Arg | Ser | Gly | Glu | Cys | Asp | Leu | Ala | | | |
| | 1170 | | | | 1175 | | | | | 1180 | | | | | | | | |
| Leu | Ala | Gly | Gly | Val | Thr | Val | Met | Ala | Thr | Pro | Gly | Met | Phe | Val | Glu | | | |
| 1185 | | | | 1190 | | | | | 1195 | | | | | 1200 | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Phe | Ser | Arg | Gln | Arg | Gly | Leu | Ala | Pro | Asp | Gly | Arg | Cys | Lys | Ser | Phe | 1205 | 1210 | 1215 | |
| Ala | Glu | Ala | Ala | Asp | Gly | Thr | Gly | Trp | Ser | Glu | Gly | Ala | Gly | Leu | Val | 1220 | 1225 | 1230 | |
| Leu | Leu | Glu | Arg | Leu | Ser | Asp | Ala | Arg | Arg | Asn | Gly | His | Glu | Val | Leu | 1235 | 1240 | 1245 | |
| Ala | Val | Val | Arg | Gly | Ser | Ala | Val | Asn | Gln | Asp | Gly | Ala | Ser | Asn | Gly | 1250 | 1255 | 1260 | |
| Leu | Thr | Ala | Pro | Asn | Gly | Ser | Ser | Gln | Gln | Arg | Val | Ile | Ala | Gln | Ala | 1265 | 1270 | 1275 | 1280 |
| Leu | Ala | Ser | Ala | Gly | Leu | Ser | Val | Ser | Asp | Val | Asp | Ala | Val | Glu | Ala | 1285 | 1290 | 1295 | |
| His | Gly | Thr | Gly | Thr | Arg | Leu | Gly | Asp | Pro | Ile | Glu | Ala | Gln | Ala | Leu | 1300 | 1305 | 1310 | |
| Ile | Ala | Thr | Tyr | Gly | Gln | Gly | Arg | Leu | Pro | Glu | Arg | Pro | Leu | Trp | Leu | 1315 | 1320 | 1325 | |
| Gly | Ser | Met | Lys | Ser | Asn | Ile | Gly | His | Ala | Gln | Ala | Ala | Ala | Gly | Ile | 1330 | 1335 | 1340 | |
| Ala | Gly | Val | Met | Lys | Met | Val | Met | Ala | Met | Arg | His | Gly | Gln | Leu | Pro | 1345 | 1350 | 1355 | 1360 |
| Arg | Thr | Leu | His | Val | Asp | Glu | Pro | Thr | Ser | Gly | Val | Asp | Trp | Ser | Ala | 1365 | 1370 | 1375 | |
| Gly | Thr | Val | Gln | Leu | Leu | Thr | Glu | Asn | Thr | Pro | Trp | Pro | Gly | Ser | Gly | 1380 | 1385 | 1390 | |
| Arg | Val | Arg | Arg | Val | Gly | Val | Ser | Ser | Phe | Gly | Ile | Ser | Gly | Thr | Asn | 1395 | 1400 | 1405 | |
| Ala | His | Val | Ile | Leu | Glu | Gln | Pro | Pro | Gly | Val | Pro | Ser | Gln | Ser | Ala | 1410 | 1415 | 1420 | |
| Gly | Pro | Gly | Ser | Gly | Ser | Val | Val | Asp | Val | Pro | Val | Val | Pro | Trp | Met | 1425 | 1430 | 1435 | 1440 |
| Val | Ser | Gly | Lys | Thr | Pro | Glu | Ala | Leu | Ser | Ala | Gln | Ala | Thr | Ala | Leu | 1445 | 1450 | 1455 | |
| Met | Thr | Tyr | Leu | Asp | Glu | Arg | Pro | Asp | Val | Ser | Ser | Leu | Asp | Val | Gly | 1460 | 1465 | 1470 | |
| Tyr | Ser | Leu | Ala | Leu | Thr | Arg | Ser | Ala | Leu | Asp | Glu | Arg | Ala | Val | Val | 1475 | 1480 | 1485 | |
| Leu | Gly | Ser | Asp | Arg | Glu | Thr | Leu | Leu | Cys | Gly | Val | Lys | Ala | Leu | Ser | 1490 | 1495 | 1500 | |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Ala Gly His Glu Ala Ser Gly Leu Val Thr Gly Ser Val Gly Ala Gly | | | |
| 1505 | 1510 | 1515 | 1520 |
| Gly Arg Ile Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly | | | |
| | 1525 | 1530 | 1535 |
| Met Gly Arg Gly Leu Tyr Arg Ala Phe Pro Val Phe Ala Ala Ala Phe | | | |
| | 1540 | 1545 | 1550 |
| Asp Glu Ala Cys Ala Glu Leu Asp Ala His Leu Gly Gln Glu Ile Gly | | | |
| | 1555 | 1560 | 1565 |
| Val Arg Glu Val Val Ser Gly Ser Asp Ala Gln Leu Leu Asp Arg Thr | | | |
| | 1570 | 1575 | 1580 |
| Leu Trp Ala Gln Ser Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Lys | | | |
| 1585 | 1590 | 1595 | 1600 |
| Leu Leu Asp Ser Trp Gly Val Arg Pro Ser Val Val Leu Gly His Ser | | | |
| | 1605 | 1610 | 1615 |
| Val Gly Glu Leu Ala Ala Ala Phe Ala Ala Gly Val Val Ser Leu Ser | | | |
| | 1620 | 1625 | 1630 |
| Gly Ala Ala Arg Leu Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu | | | |
| | 1635 | 1640 | 1645 |
| Pro Ser Gly Gly Gly Met Leu Ala Val Pro Ala Gly Glu Glu Leu Leu | | | |
| | 1650 | 1655 | 1660 |
| Trp Ser Leu Leu Ala Asp Gln Gly Asp Arg Val Gly Ile Ala Ala Val | | | |
| 1665 | 1670 | 1675 | 1680 |
| Asn Ala Ala Gly Ser Val Val Leu Ser Gly Asp Arg Asp Val Leu Asp | | | |
| | 1685 | 1690 | 1695 |
| Asp Leu Ala Gly Arg Leu Asp Gly Gln Gly Ile Arg Ser Arg Trp Leu | | | |
| | 1700 | 1705 | 1710 |
| Arg Val Ser His Ala Phe His Ser Tyr Arg Met Asp Pro Met Leu Ala | | | |
| | 1715 | 1720 | 1725 |
| Glu Phe Ala Glu Leu Ala Arg Thr Val Asp Tyr Arg Arg Cys Glu Val | | | |
| | 1730 | 1735 | 1740 |
| Pro Ile Val Ser Thr Leu Thr Gly Asp Leu Asp Asp Ala Gly Arg Met | | | |
| 1745 | 1750 | 1755 | 1760 |
| Ser Gly Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe | | | |
| | 1765 | 1770 | 1775 |
| Ala Asp Gly Val Gln Ala Leu Val Glu His Asp Val Ala Thr Val Val | | | |
| | 1780 | 1785 | 1790 |
| Glu Leu Gly Pro Asp Gly Ala Leu Ser Ala Leu Ile Gln Glu Cys Val | | | |
| | 1795 | 1800 | 1805 |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Ala Ala Ser Asp His Ala Gly Arg Leu Ser Ala Val Pro Ala Met Arg | | | |
| 1810 | 1815 | 1820 | |
| Arg Asn Gln Asp Glu Ala Gln Lys Val Met Thr Ala Leu Ala His Val | | | |
| 1825 | 1830 | 1835 | 1840 |
| His Val Arg Gly Gly Ala Val Asp Trp Arg Ser Phe Phe Ala Gly Thr | | | |
| 1845 | 1850 | 1855 | |
| Arg Ala Lys Gln Ile Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg | | | |
| 1860 | 1865 | 1870 | |
| Tyr Trp Leu Asn Ala Leu Arg Glu Ser Ser Ala Gly Asp Met Gly Arg | | | |
| 1875 | 1880 | 1885 | |
| Arg Val Glu Ala Lys Phe Trp Gly Ala Val Glu His Glu Asp Val Glu | | | |
| 1890 | 1895 | 1900 | |
| Ser Leu Ala Arg Val Leu Gly Ile Val Asp Asp Gly Ala Ala Val Asp | | | |
| 1905 | 1910 | 1915 | 1920 |
| Ser Leu Arg Ser Ala Leu Pro Val Leu Ala Gly Trp Gln Arg Thr Arg | | | |
| 1925 | 1930 | 1935 | |
| Thr Thr Glu Ser Ile Met Asp Gln Arg Cys Tyr Arg Ile Gly Trp Arg | | | |
| 1940 | 1945 | 1950 | |
| Gln Val Ala Gly Leu Pro Pro Met Gly Thr Val Phe Gly Thr Trp Leu | | | |
| 1955 | 1960 | 1965 | |
| Val Phe Ala Pro His Gly Trp Ser Ser Glu Pro Glu Val Val Asp Cys | | | |
| 1970 | 1975 | 1980 | |
| Val Thr Ala Leu Arg Ala Arg Gly Ala Ser Val Val Leu Val Glu Ala | | | |
| 1985 | 1990 | 1995 | 2000 |
| Asp Pro Asp Pro Thr Ser Phe Gly Asp Arg Val Arg Thr Leu Cys Ser | | | |
| 2005 | 2010 | 2015 | |
| Gly Leu Pro Asp Leu Val Gly Val Leu Ser Met Leu Cys Leu Glu Glu | | | |
| 2020 | 2025 | 2030 | |
| Ser Val Leu Pro Gly Phe Ser Ala Val Ser Arg Gly Phe Ala Leu Thr | | | |
| 2035 | 2040 | 2045 | |
| Val Glu Leu Val Arg Val Leu Arg Ala Ala Gly Ala Thr Ala Arg Leu | | | |
| 2050 | 2055 | 2060 | |
| Trp Leu Leu Thr Cys Gly Gly Val Ser Val Gly Asp Val Pro Val Arg | | | |
| 2065 | 2070 | 2075 | 2080 |
| Pro Ala Gln Ala Leu Ala Trp Gly Leu Gly Arg Val Val Gly Leu Glu | | | |
| 2085 | 2090 | 2095 | |
| His Pro Asp Trp Trp Gly Gly Leu Ile Asp Ile Pro Val Leu Phe Asp | | | |
| 2100 | 2105 | 2110 | |

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|-----------------------------------------------------------------|------|------|------|
| Glu Asp Ala Gln Glu Arg Leu Ser Ile Val Leu Ala Gly Leu Asp Glu | 2115 | 2120 | 2125 |
| Asp Glu Val Ala Ile Arg Pro Asp Gly Met Phe Ala Arg Arg Leu Val | 2130 | 2135 | 2140 |
| Arg His Thr Val Ser Ala Asp Val Lys Lys Ala Trp Arg Pro Arg Gly | 2145 | 2150 | 2155 |
| Ser Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala | 2165 | 2170 | 2175 |
| Arg Trp Leu Ala Asp Ala Gly Ala Glu His Val Ala Met Val Ser Arg | 2180 | 2185 | 2190 |
| Arg Gly Glu Gln Ala Pro Ser Ala Glu Lys Leu Arg Thr Glu Leu Glu | 2195 | 2200 | 2205 |
| Asp Leu Gly Thr Arg Val Ser Ile Val Ser Cys Asp Val Thr Asp Arg | 2210 | 2215 | 2220 |
| Glu Ala Leu Ala Glu Val Leu Lys Ala Leu Pro Ala Glu Asn Pro Leu | 2225 | 2230 | 2235 |
| Thr Ala Val Val His Ala Ala Gly Val Ile Glu Thr Gly Asp Ala Ala | 2245 | 2250 | 2255 |
| Ala Met Ser Leu Ala Asp Phe Asp His Val Leu Ser Ala Lys Val Ala | 2260 | 2265 | 2270 |
| Gly Ala Ala Asn Leu Asp Ala Leu Leu Ala Asp Val Glu Leu Asp Ala | 2275 | 2280 | 2285 |
| Phe Val Leu Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly His | 2290 | 2295 | 2300 |
| Gly Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln | 2305 | 2310 | 2315 |
| Arg Arg Ser Arg Gly Leu Val Ala Thr Ala Val Ala Trp Gly Pro Trp | 2325 | 2330 | 2335 |
| Ala Gly Glu Gly Met Ala Ser Gly Glu Thr Gly Asp Gln Leu Arg Arg | 2340 | 2345 | 2350 |
| Tyr Gly Leu Ser Pro Met Ala Pro Gln His Ala Ile Ala Gly Ile Arg | 2355 | 2360 | 2365 |
| Gln Ala Val Glu Gln Asp Glu Ile Ser Leu Val Val Ala Asp Val Asp | 2370 | 2375 | 2380 |
| Trp Ala Arg Phe Ser Ala Gly Leu Leu Ala Ala Arg Pro Arg Pro Leu | 2385 | 2390 | 2395 |
| Leu Asn Glu Leu Ala Glu Val Lys Glu Leu Leu Val Asp Ala Gln Pro | 2405 | 2410 | 2415 |

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|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| <400> 43 | | | | | | | | | | | | | | | | |
| atg | acg | gtg | acc | acc | agt | tac | gaa | gaa | gtt | gtc | gag | gca | ctg | cga | gca | 48 |
| Met | Thr | Val | Thr | Thr | Ser | Tyr | Glu | Glu | Val | Val | Glu | Ala | Leu | Arg | Ala | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| | | | | | | | | | | | | | | | | |
| tcg | ctc | aag | gag | aac | gaa | cgc | ctc | cgg | cgc | ggc | agg | gat | cgg | ttc | tcc | 96 |
| Ser | Leu | Lys | Glu | Asn | Glu | Arg | Leu | Arg | Arg | Gly | Arg | Asp | Arg | Phe | Ser | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |

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|-----------------------------------------------------------------|-----|
| gcg gag aag gac gat ccc atc gcg atc gtg gcg atg agt tgt cgt tat | 144 |
| Ala Glu Lys Asp Asp Pro Ile Ala Ile Val Ala Met Ser Cys Arg Tyr | |
| 35 40 45 | |
| ccc ggt cag gtc tcc tcg ccg gag gac ctg tgg caa ctg gct gcc ggc | 192 |
| Pro Gly Gln Val Ser Ser Pro Glu Asp Leu Trp Gln Leu Ala Ala Gly | |
| 50 55 60 | |
| ggt gtg gac gcg atc tcc gaa gtt ccg ggg gat cgc gga tgg gac ctg | 240 |
| Gly Val Asp Ala Ile Ser Glu Val Pro Gly Asp Arg Gly Trp Asp Leu | |
| 65 70 75 80 | |
| gat ggc gtg ttc gtt ccg gac tcc gat cgt cct ggc acg tcg tat gcc | 288 |
| Asp Gly Val Phe Val Pro Asp Ser Asp Arg Pro Gly Thr Ser Tyr Ala | |
| 85 90 95 | |
| tgc gcg ggc ggt ttt ctt cag ggc gtg tcg gag ttc gac gcg ggt ttc | 336 |
| Cys Ala Gly Gly Phe Leu Gln Gly Val Ser Glu Phe Asp Ala Gly Phe | |
| 100 105 110 | |
| ttc ggg att tcg ccg cgt gag gcg ctg gcg atg gat ccg cag cag cgg | 384 |
| Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg | |
| 115 120 125 | |
| ttg ctg ctg gaa gtc gcg tgg gag gtc ttc gag cgg gct ggg ctg gag | 432 |
| Leu Leu Leu Glu Val Ala Trp Glu Val Phe Glu Arg Ala Gly Leu Glu | |
| 130 135 140 | |
| cag cgg tcg aca cgc ggt tcc cgc gtt ggc gtg ttc gtc ggc acc aat | 480 |
| Gln Arg Ser Thr Arg Gly Ser Arg Val Gly Val Phe Val Gly Thr Asn | |
| 145 150 155 160 | |
| ggc cag gac tac gcg tcg tgg ttg cgg acg ccg ccg cct gcg gtg gca | 528 |
| Gly Gln Asp Tyr Ala Ser Trp Leu Arg Thr Pro Pro Pro Ala Val Ala | |
| 165 170 175 | |
| ggt cat gtg ctg acg ggc ggt gcg gca gcg gtt ctt tcg ggc cgg gtt | 576 |
| Gly His Val Leu Thr Gly Gly Ala Ala Ala Val Leu Ser Gly Arg Val | |
| 180 185 190 | |
| gcg tat tcg ttc ggg ttc gag ggt cct gcg gtg acg gtg gat acg gcg | 624 |
| Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala | |
| 195 200 205 | |
| tgt tcg tcg tcg ttg gtg gcg ttg cac ctg gcg ggg caa gca ctg cgg | 672 |
| Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu Arg | |
| 210 215 220 | |
| gcc ggt gag tgc gac ctt gcc ctt gcc ggt ggc gtc acg gtg atg tcg | 720 |
| Ala Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ser | |
| 225 230 235 240 | |
| acg ccg aag gtg ttc ctg gag ttc tcc cgc caa cgg ggt ctc gcg ccg | 768 |
| Thr Pro Lys Val Phe Leu Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro | |
| 245 250 255 | |
| gat ggg cgg tgc aag tcg ttc gcg gcg ggt gcg gat ggc act gga tgg | 816 |

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Asp | Gly | Arg | Cys | Lys | Ser | Phe | Ala | Ala | Gly | Ala | Asp | Gly | Thr | Gly | Trp | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| ggt | gag | ggt | gcc | gga | ctg | ttg | ttg | ctg | gag | cgg | ttg | tcg | gat | gcc | cgg | 864 |
| Gly | Glu | Gly | Ala | Gly | Leu | Leu | Leu | Leu | Glu | Arg | Leu | Ser | Asp | Ala | Arg | |
| | | | 275 | | | | 280 | | | | | 285 | | | | |
| cgg | aat | ggg | cat | gag | gtg | ctg | gcg | gtt | gtt | cgt | ggt | agt | gcg | gtg | aat | 912 |
| Arg | Asn | Gly | His | Glu | Val | Leu | Ala | Val | Val | Arg | Gly | Ser | Ala | Val | Asn | |
| | 290 | | | | | 295 | | | | | 300 | | | | | |
| cag | gac | ggt | gcg | tcg | aat | ggt | ttg | acc | gcg | cgg | aat | ggt | tcg | tcg | cag | 960 |
| Gln | Asp | Gly | Ala | Ser | Asn | Gly | Leu | Thr | Ala | Pro | Asn | Gly | Ser | Ser | Gln | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| cag | cgg | gtg | att | acc | cag | gcg | ttg | gcg | agt | gcg | ggg | ttg | tcg | gtg | tcc | 1008 |
| Gln | Arg | Val | Ile | Thr | Gln | Ala | Leu | Ala | Ser | Ala | Gly | Leu | Ser | Val | Ser | |
| | | | | 325 | | | | | 330 | | | | | 335 | | |
| gat | gtg | gat | gct | gtg | gag | gcg | cat | ggg | acg | ggc | acg | cgg | ctt | ggt | gat | 1056 |
| Asp | Val | Asp | Ala | Val | Glu | Ala | His | Gly | Thr | Gly | Thr | Arg | Leu | Gly | Asp | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| ccg | atc | gag | gcg | cag | gcg | ctg | atc | gcc | acc | tac | ggc | cgt | gat | cgt | gat | 1104 |
| Pro | Ile | Glu | Ala | Gln | Ala | Leu | Ile | Ala | Thr | Tyr | Gly | Arg | Asp | Arg | Asp | |
| | | 355 | | | | | 360 | | | | | 365 | | | | |
| cct | ggc | cgg | ccg | ttg | tgg | ttg | ggg | tcg | gtc | aag | tcg | aac | atc | ggt | cat | 1152 |
| Pro | Gly | Arg | Pro | Leu | Trp | Leu | Gly | Ser | Val | Lys | Ser | Asn | Ile | Gly | His | |
| | 370 | | | | | 375 | | | | | 380 | | | | | |
| acg | caa | gcg | gcg | gcg | ggt | gtg | gct | ggt | gtg | atc | aag | atg | gtg | atg | gcg | 1200 |
| Thr | Gln | Ala | Ala | Ala | Gly | Val | Ala | Gly | Val | Ile | Lys | Met | Val | Met | Ala | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | |
| atg | cgg | cac | ggg | cag | ctg | cca | cgc | acg | ttg | cac | gtg | gaa | tcg | ccg | tcg | 1248 |
| Met | Arg | His | Gly | Gln | Leu | Pro | Arg | Thr | Leu | His | Val | Glu | Ser | Pro | Ser | |
| | | | | 405 | | | | 410 | | | | | | 415 | | |
| ccg | gag | gtg | gat | tgg | tcg | gcg | ggg | acg | gtt | caa | ctc | ctt | acg | gag | aac | 1296 |
| Pro | Glu | Val | Asp | Trp | Ser | Ala | Gly | Thr | Val | Gln | Leu | Leu | Thr | Glu | Asn | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| acg | ccc | tgg | ccc | agg | agt | ggt | cgt | gtt | cgt | cgg | gtg | ggg | gtg | tcg | tcg | 1344 |
| Thr | Pro | Trp | Pro | Arg | Ser | Gly | Arg | Val | Arg | Arg | Val | Gly | Val | Ser | Ser | |
| | | 435 | | | | | 440 | | | | | 445 | | | | |
| ttc | ggg | atc | agt | ggt | act | aac | gcg | cac | gtc | atc | ctc | gaa | cag | ccc | ccg | 1392 |
| Phe | Gly | Ile | Ser | Gly | Thr | Asn | Ala | His | Val | Ile | Leu | Glu | Gln | Pro | Pro | |
| | 450 | | | | | 455 | | | | | 460 | | | | | |
| gga | gtg | ccg | agt | cag | tct | gcg | ggg | ccg | ggt | tcg | ggt | tct | gtc | gtg | gat | 1440 |
| Gly | Val | Pro | Ser | Gln | Ser | Ala | Gly | Pro | Gly | Ser | Gly | Ser | Val | Val | Asp | |
| 465 | | | | | 470 | | | | 475 | | | | | | 480 | |
| gtt | ccg | gtg | gtg | ccg | tgg | atg | gtg | tcg | ggc | aaa | aca | ccc | gaa | gcg | cta | 1488 |
| Val | Pro | Val | Val | Pro | Trp | Met | Val | Ser | Gly | Lys | Thr | Pro | Glu | Ala | Leu | |

| 485 | | | | | | | | | | 490 | | | | | 495 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|--|--|
| tcc | gcg | cag | gca | acg | gcg | ttg | atg | acc | tat | ctg | gac | gag | cga | cct | gat | 1536 | | | | |
| Ser | Ala | Gln | Ala | Thr | Ala | Leu | Met | Thr | Tyr | Leu | Asp | Glu | Arg | Pro | Asp | | | | | |
| | | | 500 | | | | 505 | | | | 510 | | | | | | | | | |
| gtc | tcc | tcg | ctg | gat | gtt | ggg | tac | tcg | ctg | gcg | ttg | aca | cgg | tcg | gcg | 1584 | | | | |
| Val | Ser | Ser | Leu | Asp | Val | Gly | Tyr | Ser | Leu | Ala | Leu | Thr | Arg | Ser | Ala | | | | | |
| | | | 515 | | | | 520 | | | | 525 | | | | | | | | | |
| ctg | gat | gag | cga | gcg | gtg | gtg | ctg | ggg | tcg | gac | cgt | gaa | acg | ttg | ttg | 1632 | | | | |
| Leu | Asp | Glu | Arg | Ala | Val | Val | Leu | Gly | Ser | Asp | Arg | Glu | Thr | Leu | Leu | | | | | |
| | | | 530 | | | | 535 | | | | 540 | | | | | | | | | |
| tgc | ggg | gtg | aaa | gcg | ctg | tct | gcc | ggg | cat | gag | gct | tct | ggg | ttg | gtg | 1680 | | | | |
| Cys | Gly | Val | Lys | Ala | Leu | Ser | Ala | Gly | His | Glu | Ala | Ser | Gly | Leu | Val | | | | | |
| 545 | | | | 550 | | | | 555 | | | | 560 | | | | | | | | |
| acc | gga | tct | gtg | ggg | gct | ggg | ggc | cgc | atc | ggg | ttt | gtg | ttt | tcc | ggg | 1728 | | | | |
| Thr | Gly | Ser | Val | Gly | Ala | Gly | Gly | Arg | Ile | Gly | Phe | Val | Phe | Ser | Gly | | | | | |
| | | | 565 | | | | 570 | | | | 575 | | | | | | | | | |
| cag | ggg | ggg | cag | tgg | ctg | ggg | atg | ggc | cgg | ggg | ctt | tac | cgg | gct | ttt | 1776 | | | | |
| Gln | Gly | Gly | Gln | Trp | Leu | Gly | Met | Gly | Arg | Gly | Leu | Tyr | Arg | Ala | Phe | | | | | |
| | | | 580 | | | | 585 | | | | 590 | | | | | | | | | |
| ccg | gtg | ttc | gct | gct | gcc | ttt | gac | gaa | gct | tgt | gcc | gag | ctg | gat | gca | 1824 | | | | |
| Pro | Val | Phe | Ala | Ala | Ala | Phe | Asp | Glu | Ala | Cys | Ala | Glu | Leu | Asp | Ala | | | | | |
| | | | 595 | | | | 600 | | | | 605 | | | | | | | | | |
| cat | ctg | ggc | cag | gaa | atc | ggg | gtt | cgg | gag | gtg | gtg | tcc | ggg | tcg | gat | 1872 | | | | |
| His | Leu | Gly | Gln | Glu | Ile | Gly | Val | Arg | Glu | Val | Val | Ser | Gly | Ser | Asp | | | | | |
| | | | 610 | | | | 615 | | | | 620 | | | | | | | | | |
| gcg | cag | ttg | ctg | gat | cgg | acg | ttg | tgg | gcg | cag | tcg | ggg | ttg | ttc | gcg | 1920 | | | | |
| Ala | Gln | Leu | Leu | Asp | Arg | Thr | Leu | Trp | Ala | Gln | Ser | Gly | Leu | Phe | Ala | | | | | |
| 625 | | | | 630 | | | | 635 | | | | 640 | | | | | | | | |
| ttg | cag | gtg | ggc | ttg | ctg | aag | ttg | ctg | gat | tcg | tgg | ggg | gtt | cgg | ccg | 1968 | | | | |
| Leu | Gln | Val | Gly | Leu | Leu | Lys | Leu | Leu | Asp | Ser | Trp | Gly | Val | Arg | Pro | | | | | |
| | | | 645 | | | | 650 | | | | 655 | | | | | | | | | |
| agt | gtg | gtg | ttg | ggg | cat | tcg | gtg | ggc | gag | ttg | gcg | gcg | gcg | ttc | gcg | 2016 | | | | |
| Ser | Val | Val | Leu | Gly | His | Ser | Val | Gly | Glu | Leu | Ala | Ala | Ala | Phe | Ala | | | | | |
| | | | 660 | | | | 665 | | | | 670 | | | | | | | | | |
| gcg | ggg | gtg | gtg | tcg | ttg | tcg | ggg | gcg | gct | cgg | ttg | gtg | gcg | ggg | cgt | 2064 | | | | |
| Ala | Gly | Val | Val | Ser | Leu | Ser | Gly | Ala | Ala | Arg | Leu | Val | Ala | Gly | Arg | | | | | |
| | | | 675 | | | | 680 | | | | 685 | | | | | | | | | |
| gcc | cgg | ttg | atg | cag | gcg | ttg | ccg | tct | ggc | ggg | ggg | atg | ctg | gcg | gtg | 2112 | | | | |
| Ala | Arg | Leu | Met | Gln | Ala | Leu | Pro | Ser | Gly | Gly | Gly | Met | Leu | Ala | Val | | | | | |
| | | | 690 | | | | 695 | | | | 700 | | | | | | | | | |
| cct | gct | ggg | gag | gag | ctg | ttg | tgg | tcg | ttg | ttg | gcc | gat | cag | ggg | gat | 2160 | | | | |
| Pro | Ala | Gly | Glu | Glu | Leu | Leu | Trp | Ser | Leu | Leu | Ala | Asp | Gln | Gly | Asp | | | | | |
| 705 | | | | 710 | | | | 715 | | | | 720 | | | | | | | | |

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|-----------------------------------------------------------------|------|
| cgt gtg ggg atc gcc gcg gtc aac gct gcg ggg tcg gtg gtg ctc tct | 2208 |
| Arg Val Gly Ile Ala Ala Val Asn Ala Ala Gly Ser Val Val Leu Ser | |
| 725 730 735 | |
| ggt gat cgg gat gtg ctc gat gac ctt gcc ggt cgg ctg gac ggg caa | 2256 |
| Gly Asp Arg Asp Val Leu Asp Asp Leu Ala Gly Arg Leu Asp Gly Gln | |
| 740 745 750 | |
| ggg atc cgg tcg agg tgg ttg cgg gtg tcg cat gcg ttt cat tcg tat | 2304 |
| Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser Tyr | |
| 755 760 765 | |
| cgg atg gat ccg atg ctg gcg gag ttc gcc gaa ttg gca cga acc gtg | 2352 |
| Arg Met Asp Pro Met Leu Ala Glu Phe Ala Glu Leu Ala Arg Thr Val | |
| 770 775 780 | |
| gat tac cgg cgt tgt gaa gtg ccg atc gtg tcg acc ttg acc gga gac | 2400 |
| Asp Tyr Arg Arg Cys Glu Val Pro Ile Val Ser Thr Leu Thr Gly Asp | |
| 785 790 795 800 | |
| ctc gat gac gct ggc agg atg agc ggg ccc gac tac tgg gtg cgt cag | 2448 |
| Leu Asp Asp Ala Gly Arg Met Ser Gly Pro Asp Tyr Trp Val Arg Gln | |
| 805 810 815 | |
| gtg cga gag ccg gtc cgc ttc gcc gac ggt gtc cag gcg ctg gtc gag | 2496 |
| Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Gln Ala Leu Val Glu | |
| 820 825 830 | |
| cac gat gtg gcc act gtt gtc gag ctc ggt ccg gac ggg gcg ttg tcg | 2544 |
| His Asp Val Ala Thr Val Val Glu Leu Gly Pro Asp Gly Ala Leu Ser | |
| 835 840 845 | |
| gcg ctg atc cag gaa tgt gtc gcc gca tcc gat cac gcc ggg cgg ctg | 2592 |
| Ala Leu Ile Gln Glu Cys Val Ala Ala Ser Asp His Ala Gly Arg Leu | |
| 850 855 860 | |
| agc gcg gtc ccg gcg atg cgc agg aac cag gac gag gcg cag aag gtg | 2640 |
| Ser Ala Val Pro Ala Met Arg Arg Asn Gln Asp Glu Ala Gln Lys Val | |
| 865 870 875 880 | |
| atg acg gcc ctg gca cac gtc cac gta cgt ggt ggt gcg gtg gac tgg | 2688 |
| Met Thr Ala Leu Ala His Val His Val Arg Gly Gly Ala Val Asp Trp | |
| 885 890 895 | |
| cgg tcg ttc ttc gcc ggt acg gga gcg aaa caa atc gag ctg ccc acc | 2736 |
| Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Ile Glu Leu Pro Thr | |
| 900 905 910 | |
| tac gcc ttc caa cga cag cgg tac tgg ctg gtg cca tcg gat tcc ggt | 2784 |
| Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Val Pro Ser Asp Ser Gly | |
| 915 920 925 | |
| gat gtg aca ggt gcc ggt ctg gcc ggg gcg gag cat ccg ctg ttg ggt | 2832 |
| Asp Val Thr Gly Ala Gly Leu Ala Gly Ala Glu His Pro Leu Leu Gly | |
| 930 935 940 | |

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|-----------------------------------------------------------------|------|
| gct gtg gtg ccg gtc gcg ggt ggt gac gag gtg ttg ctg acc ggc agg | 2880 |
| Ala Val Val Pro Val Ala Gly Gly Asp Glu Val Leu Leu Thr Gly Arg | |
| 945 950 955 960 | |
| att tcg gtg cgg acg cat ccg tgg ctg gcc gaa cac cgg gtg ctg ggt | 2928 |
| Ile Ser Val Arg Thr His Pro Trp Leu Ala Glu His Arg Val Leu Gly | |
| 965 970 975 | |
| gaa gtg atc gtt gcg ggc acc gcg ttg ctg gag atc gcc ttg cac gcg | 2976 |
| Glu Val Ile Val Ala Gly Thr Ala Leu Leu Glu Ile Ala Leu His Ala | |
| 980 985 990 | |
| ggg gaa cgt ctt ggt tgt gaa cgg gtg gaa gag ctg acc ctg gaa gca | 3024 |
| Gly Glu Arg Leu Gly Cys Glu Arg Val Glu Glu Leu Thr Leu Glu Ala | |
| 995 1000 1005 | |
| ccg ctg gtc ctg ccg gag cgc ggg gcg atc cag gtt cag ctg cga gtg | 3072 |
| Pro Leu Val Leu Pro Glu Arg Gly Ala Ile Gln Val Gln Leu Arg Val | |
| 1010 1015 1020 | |
| ggc gcg ccc gag aat tcc gga cgc agg ccg atg gcg ctg tat tca cgc | 3120 |
| Gly Ala Pro Glu Asn Ser Gly Arg Arg Pro Met Ala Leu Tyr Ser Arg | |
| 1025 1030 1035 1040 | |
| ccc gaa ggg gcg gcg gag cat gac tgg acg cgg cac gcc acg ggc cgg | 3168 |
| Pro Glu Gly Ala Ala Glu His Asp Trp Thr Arg His Ala Thr Gly Arg | |
| 1045 1050 1055 | |
| ttg gcg cca ggc cgc ggc gag gcg gct gga gac ctg gcc gac tgg ccg | 3216 |
| Leu Ala Pro Gly Arg Gly Glu Ala Ala Gly Asp Leu Ala Asp Trp Pro | |
| 1060 1065 1070 | |
| gct cct ggc gcg ctg ccg gtc gac ctg gac gaa ttc tat cgg qac ctg | 3264 |
| Ala Pro Gly Ala Leu Pro Val Asp Leu Asp Glu Phe Tyr Arg Asp Leu | |
| 1075 1080 1085 | |
| gca gag ctt ggg ctg gag tac ggc ccg atc ttc caa ggg ctg aag gcg | 3312 |
| Ala Glu Leu Gly Leu Glu Tyr Gly Pro Ile Phe Gln Gly Leu Lys Ala | |
| 1090 1095 1100 | |
| gcc tgg cgg caa ggg gac gag gtg tac gcc gaa gcc gcg ctg ccg gga | 3360 |
| Ala Trp Arg Gln Gly Asp Glu Val Tyr Ala Glu Ala Ala Leu Pro Gly | |
| 1105 1110 1115 1120 | |
| acg gaa gat tct ggt ttc ggg gtg cat ccg gca ctg ctg gac gcg gct | 3408 |
| Thr Glu Asp Ser Gly Phe Gly Val His Pro Ala Leu Leu Asp Ala Ala | |
| 1125 1130 1135 | |
| ctg cac gca acg gct gtc cga gac atg gat gac gca cgc ttg ccg ttc | 3456 |
| Leu His Ala Thr Ala Val Arg Asp Met Asp Asp Ala Arg Leu Pro Phe | |
| 1140 1145 1150 | |
| cag tgg gaa ggt gtg tcc ctg cac gcc aag gcc gcg ccg gct ttg cgg | 3504 |
| Gln Trp Glu Gly Val Ser Leu His Ala Lys Ala Ala Pro Ala Leu Arg | |
| 1155 1160 1165 | |
| gtc cgc gtg gtc ccg gct ggt gac gat gcc aag tcc ctg ctg gtt tgt | 3552 |

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|-----------------------------------------------------------------|------|
| Val Arg Val Val Pro Ala Gly Asp Asp Ala Lys Ser Leu Leu Val Cys | |
| 1170 1175 1180 | |
| gat ggc acc ggt cga ccg gtg atc tcg gtg gac cga ctc gta ttg cgg | 3600 |
| Asp Gly Thr Gly Arg Pro Val Ile Ser Val Asp Arg Leu Val Leu Arg | |
| 1185 1190 1195 1200 | |
| tcg gct gcg gcc cgg cgg acc ggt gcg cgc cga cag gcc cat caa gct | 3648 |
| Ser Ala Ala Ala Arg Arg Thr Gly Ala Arg Arg Gln Ala His Gln Ala | |
| 1205 1210 1215 | |
| cgg ttg tac cgg ttg agc tgg cca acg gtt caa ctg ccg aca tcc gct | 3696 |
| Arg Leu Tyr Arg Leu Ser Trp Pro Thr Val Gln Leu Pro Thr Ser Ala | |
| 1220 1225 1230 | |
| cag cca ccg tcc tgc gtg ctt ctc ggc acc tca gaa gtg tcc gct gac | 3744 |
| Gln Pro Pro Ser Cys Val Leu Leu Gly Thr Ser Glu Val Ser Ala Asp | |
| 1235 1240 1245 | |
| ata cag gtg tat ccg gac ctc cgg tcg ttg acg gct gcg ttg gat gcc | 3792 |
| Ile Gln Val Tyr Pro Asp Leu Arg Ser Leu Thr Ala Ala Leu Asp Ala | |
| 1250 1255 1260 | |
| ggt gcc gaa cca ccc ggc gtc gtc atc gca ccc acg ccc ccc ggc ggt | 3840 |
| Gly Ala Glu Pro Pro Gly Val Val Ile Ala Pro Thr Pro Pro Gly Gly | |
| 1265 1270 1275 1280 | |
| gga cga aca gcg gat gtc cgg gag acg act cgg cat gca ctc gac ctg | 3888 |
| Gly Arg Thr Ala Asp Val Arg Glu Thr Thr Arg His Ala Leu Asp Leu | |
| 1285 1290 1295 | |
| gta caa ggc tgg ctt tcc gat cag cga ctc aac gaa tcc cga ttg ctc | 3936 |
| Val Gln Gly Trp Leu Ser Asp Gln Arg Leu Asn Glu Ser Arg Leu Leu | |
| 1300 1305 1310 | |
| ctg gtg aca cag gga gca gtg gcc gtg gag ccg ggc gaa ccc gtg acc | 3984 |
| Leu Val Thr Gln Gly Ala Val Ala Val Glu Pro Gly Glu Pro Val Thr | |
| 1315 1320 1325 | |
| gat ctg gcg cag gcc gcg ctc tgg gga ctg ctg cgg tcg acg cag acc | 4032 |
| Asp Leu Ala Gln Ala Ala Leu Trp Gly Leu Leu Arg Ser Thr Gln Thr | |
| 1330 1335 1340 | |
| gaa cac cct gat cgc ttc gtc ctc gtc gat gtg cct gag ccc gcg caa | 4080 |
| Glu His Pro Asp Arg Phe Val Leu Val Asp Val Pro Glu Pro Ala Gln | |
| 1345 1350 1355 1360 | |
| ctc ctc ccc gcg ctg ccg ggg gtg ctg gcc tgc ggc gaa cct cag ctc | 4128 |
| Leu Leu Pro Ala Leu Pro Gly Val Leu Ala Cys Gly Glu Pro Gln Leu | |
| 1365 1370 1375 | |
| gcg ttg cga cgt ggc ggc gct cat gcg ccc aga ctg gct gga ctg ggc | 4176 |
| Ala Leu Arg Arg Gly Gly Ala His Ala Pro Arg Leu Ala Gly Leu Gly | |
| 1380 1385 1390 | |
| agc gat gac gtc ctg ccc gtg ccg gac ggc acc ggg tgg cga ttg gag | 4224 |
| Ser Asp Asp Val Leu Pro Val Pro Asp Gly Thr Gly Trp Arg Leu Glu | |

| 1395 | 1400 | 1405 | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| gcc acg cgc ccg gga agc ctg gat ggg ttg gca ttg gtg gac gaa ccg Ala Thr Arg Pro Gly Ser Leu Asp Gly Leu Ala Leu Val Asp Glu Pro 1410 1415 1420 | | | 4272 |
| acg gcc acg gca ccg ctg ggt gac ggt gag gtc agg att gcg atg cgc Thr Ala Thr Ala Pro Leu Gly Asp Gly Glu Val Arg Ile Ala Met Arg 1425 1430 1435 1440 | | | 4320 |
| gcg gcc ggg gtg aac ttc cgg gat gcg ctc atc gcg ctc ggt atg tat Ala Ala Gly Val Asn Phe Arg Asp Ala Leu Ile Ala Leu Gly Met Tyr 1445 1450 1455 | | | 4368 |
| ccc ggt gtg gca tcg ctg ggc agt gag ggc gcc ggg gtc gtg gtg gag Pro Gly Val Ala Ser Leu Gly Ser Glu Gly Ala Gly Val Val Val Glu 1460 1465 1470 | | | 4416 |
| acc ggc ccc ggc gtc acc ggc ctg gca ccc ggc gac cgc gtg atg gga Thr Gly Pro Gly Val Thr Gly Leu Ala Pro Gly Asp Arg Val Met Gly 1475 1480 1485 | | | 4464 |
| atg atc ccg aag gcg ttc ggg ccg ctc gcg gtc gcc gac cat cgc atg Met Ile Pro Lys Ala Phe Gly Pro Leu Ala Val Ala Asp His Arg Met 1490 1495 1500 | | | 4512 |
| gtg acg agg att ccc gct ggt tgg agc ttc gcg cgg gcc gca tcg gtg Val Thr Arg Ile Pro Ala Gly Trp Ser Phe Ala Arg Ala Ala Ser Val 1505 1510 1515 1520 | | | 4560 |
| ccg atc gtc ttt ctc acc gcc tac tac gcg ctg gtt gat ctc gcc ggg Pro Ile Val Phe Leu Thr Ala Tyr Tyr Ala Leu Val Asp Leu Ala Gly 1525 1530 1535 | | | 4608 |
| ttg aga cca ggg gag tcg ttg ctg gtt cat tcg gcc gcc ggt ggg gtg Leu Arg Pro Gly Glu Ser Leu Leu Val His Ser Ala Ala Gly Gly Val 1540 1545 1550 | | | 4656 |
| ggg atg gcc gcg atc caa ctc gcc agg cac ctc ggt gca gag gtg tac Gly Met Ala Ala Ile Gln Leu Ala Arg His Leu Gly Ala Glu Val Tyr 1555 1560 1565 | | | 4704 |
| gcc acc gct agc gag gac aag tgg caa gcc gtg gag ctg agc cga gaa Ala Thr Ala Ser Glu Asp Lys Trp Gln Ala Val Glu Leu Ser Arg Glu 1570 1575 1580 | | | 4752 |
| cac ctc gct tcg tcg cgg acg tgc gat ttc gag cag cag ttc ctc ggg His Leu Ala Ser Ser Arg Thr Cys Asp Phe Glu Gln Gln Phe Leu Gly 1585 1590 1595 1600 | | | 4800 |
| gca acc ggc gga cgc ggc gtc gac gtc gtg ctc aac tcc ctc gcc ggg Ala Thr Gly Gly Arg Gly Val Asp Val Val Leu Asn Ser Leu Ala Gly 1605 1610 1615 | | | 4848 |
| gag ttc gcc gat gcg tct ctg cga atg ctg ccg cgc ggt ggc cgt ttc Glu Phe Ala Asp Ala Ser Leu Arg Met Leu Pro Arg Gly Gly Arg Phe 1620 1625 1630 | | | 4896 |

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|-----------------------------------------------------------------|------|
| ctg gag ttg ggg aag acg gat gtt cgt gac ccc gtc gag gtc gcc gat | 4944 |
| Leu Glu Leu Gly Lys Thr Asp Val Arg Asp Pro Val Glu Val Ala Asp | |
| 1635 1640 1645 | |
| gcg cat ccg ggc gtg tct tac cag gct ttc gat acc gta gag gca ggc | 4992 |
| Ala His Pro Gly Val Ser Tyr Gln Ala Phe Asp Thr Val Glu Ala Gly | |
| 1650 1655 1660 | |
| ccg cag cga atc ggc gag atg ctt cac gag ctg gtg gag ttg ttc gag | 5040 |
| Pro Gln Arg Ile Gly Glu Met Leu His Glu Leu Val Glu Leu Phe Glu | |
| 1665 1670 1675 1680 | |
| gga cgc gtg ctg gag ccc ctg cct gtc acg gct tgg gac gtt cgg cag | 5088 |
| Gly Arg Val Leu Glu Pro Leu Pro Val Thr Ala Trp Asp Val Arg Gln | |
| 1685 1690 1695 | |
| gcg ccc gag gcg cta cgg cac ctg agc caa gcg cgg cat gtg gga aag | 5136 |
| Ala Pro Glu Ala Leu Arg His Leu Ser Gln Ala Arg His Val Gly Lys | |
| 1700 1705 1710 | |
| ctg gtg ctc acc atg cct ccg gtg tgg gac gcc gca ggc acg gtt ctg | 5184 |
| Leu Val Leu Thr Met Pro Pro Val Trp Asp Ala Ala Gly Thr Val Leu | |
| 1715 1720 1725 | |
| gtt acc ggc gga acg gga gca ctt ggc gca gag gtc gcc cgg cac ctc | 5232 |
| Val Thr Gly Gly Thr Gly Ala Leu Gly Ala Glu Val Ala Arg His Leu | |
| 1730 1735 1740 | |
| gtg atc gag cgc ggg gtg cga aac ctg gtc ctc gtc agc agg cgc ggt | 5280 |
| Val Ile Glu Arg Gly Val Arg Asn Leu Val Leu Val Ser Arg Arg Gly | |
| 1745 1750 1755 1760 | |
| ccc gca gcc agt ggc gct gct gag ctc gtg gcg caa ctg acg gcc tac | 5328 |
| Pro Ala Ala Ser Gly Ala Ala Glu Leu Val Ala Gln Leu Thr Ala Tyr | |
| 1765 1770 1775 | |
| ggt gcc gag gtt tcc ttg cag gct tgc gat gtc gcc gat cgt gag acc | 5376 |
| Gly Ala Glu Val Ser Leu Gln Ala Cys Asp Val Ala Asp Arg Glu Thr | |
| 1780 1785 1790 | |
| ttg gcg aag gtg ctt gcc agc atc ccg gac gag cat ccg ttg acc gcc | 5424 |
| Leu Ala Lys Val Leu Ala Ser Ile Pro Asp Glu His Pro Leu Thr Ala | |
| 1795 1800 1805 | |
| gtg gtg cac gcg gct ggt gtt ctc gac gac gga gtg tcc gaa tcg ctc | 5472 |
| Val Val His Ala Ala Gly Val Leu Asp Asp Gly Val Ser Glu Ser Leu | |
| 1810 1815 1820 | |
| acc gtg gag cgg ctg gac cag gtt ctg cgc ccg aag gtc gat ggc gcg | 5520 |
| Thr Val Glu Arg Leu Asp Gln Val Leu Arg Pro Lys Val Asp Gly Ala | |
| 1825 1830 1835 1840 | |
| cgg aat ctg ctc gag ctg atc gac ccg gac gtg gcc ctc gtg ttg ttc | 5568 |
| Arg Asn Leu Leu Glu Leu Ile Asp Pro Asp Val Ala Leu Val Leu Phe | |
| 1845 1850 1855 | |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| tcg tcg gtg tcg ggt gtg ctc ggc agc ggt ggg cag ggt aac tac gcg Ser Ser Val Ser Gly Val Leu Gly Ser Gly Gly Gln Gly Asn Tyr Ala 1860 1865 1870 | 5616 |
| gcg gcc aac tcc ttc ctc gac gca ttg gcg cag caa agg cag tcg cgc Ala Ala Asn Ser Phe Leu Asp Ala Leu Ala Gln Gln Arg Gln Ser Arg 1875 1880 1885 | 5664 |
| ggc cta ccg acg aga tca ttg gcc tgg ggg ccc tgg gcg gaa cat ggc Gly Leu Pro Thr Arg Ser Leu Ala Trp Gly Pro Trp Ala Glu His Gly 1890 1895 1900 | 5712 |
| atg gcc agc acc ttg cgc gaa gcc gag cag gat cga ttg gcg cga tct Met Ala Ser Thr Leu Arg Glu Ala Glu Gln Asp Arg Leu Ala Arg Ser 1905 1910 1915 1920 | 5760 |
| ggg ttg ctg ccg atc tcg acc gag gag ggg ttg tcc cag ttc gac gcc Gly Leu Leu Pro Ile Ser Thr Glu Glu Gly Leu Ser Gln Phe Asp Ala 1925 1930 1935 | 5808 |
| gcg tgc ggc ggc gcg cat acc gtg gtg gcg ccg gtt cga ttc agc cgc Ala Cys Gly Gly Ala His Thr Val Val Ala Pro Val Arg Phe Ser Arg 1940 1945 1950 | 5856 |
| ttg tcc gac ggg aac gcg atc aag ttc tcc gtc ctg caa ggt ttg gtc Leu Ser Asp Gly Asn Ala Ile Lys Phe Ser Val Leu Gln Gly Leu Val 1955 1960 1965 | 5904 |
| ggg ccg cat cgc gtc aac aaa gcg gcg act gcg gat gat gcc gag agc Gly Pro His Arg Val Asn Lys Ala Ala Thr Ala Asp Asp Ala Glu Ser 1970 1975 1980 | 5952 |
| ctc cgg aaa cgg ttg gga cgc ttg ccg gat gca gaa caa cat cgg att Leu Arg Lys Arg Leu Gly Arg Leu Pro Asp Ala Glu Gln His Arg Ile 1985 1990 1995 2000 | 6000 |
| ctg ctg gac ctc gtc cgc atg cat gtg gcg gca gtg ctc gga ttc gcc Leu Leu Asp Leu Val Arg Met His Val Ala Ala Val Leu Gly Phe Ala 2005 2010 2015 | 6048 |
| ggt tct cag gag atc acc gcg gac ggc acg ttc aag gtg ctg ggc ttc Gly Ser Gln Glu Ile Thr Ala Asp Gly Thr Phe Lys Val Leu Gly Phe 2020 2025 2030 | 6096 |
| gac tcg ttg acc gtg gtc gag ttg cgc aac cgg atc aac ggg gcg acg Asp Ser Leu Thr Val Val Glu Leu Arg Asn Arg Ile Asn Gly Ala Thr 2035 2040 2045 | 6144 |
| ggg ctg cga ctg ccc gcc acc ctg gtg ttc aac tac ccg acg ccg gat Gly Leu Arg Leu Pro Ala Thr Leu Val Phe Asn Tyr Pro Thr Pro Asp 2050 2055 2060 | 6192 |
| gcg ctc gcc gcg cac ctc gtc acc gcg ctg tcc gca gac cgc ctg gcc Ala Leu Ala Ala His Leu Val Thr Ala Leu Ser Ala Asp Arg Leu Ala 2065 2070 2075 2080 | 6240 |
| ggg aca ttc gag gaa ctc gac agg tgg gcg gcg aac ctg ccc acg ctg | 6288 |

| | |
|-----------------------------------------------------------------|------|
| Gly Thr Phe Glu Glu Leu Asp Arg Trp Ala Ala Asn Leu Pro Thr Leu | |
| 2085 2090 2095 | |
| gcc agg gat gag gcc acg cgg gcg cag atc acc acc cgg cta cag gcg | 6336 |
| Ala Arg Asp Glu Ala Thr Arg Ala Gln Ile Thr Thr Arg Leu Gln Ala | |
| 2100 2105 2110 | |
| atc ttg cag agc ctg gcg gac gtg tcc ggc gga acc ggc ggc ggc tcc | 6384 |
| Ile Leu Gln Ser Leu Ala Asp Val Ser Gly Gly Thr Gly Gly Gly Ser | |
| 2115 2120 2125 | |
| gtg ccg gac cgg ctc aga tcg gcc acg gac gac gag ctt ttc caa ctc | 6432 |
| Val Pro Asp Arg Leu Arg Ser Ala Thr Asp Asp Glu Leu Phe Gln Leu | |
| 2130 2135 2140 | |
| ctc gac aac gat ctc gaa ctt ccc tga | 6459 |
| Leu Asp Asn Asp Leu Glu Leu Pro | |
| 2145 2150 | |

<210> 44
 <211> 2152
 <212> PRT
 <213> Saccharopolyspora spinosa

| | |
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| <400> 44 | |
| Met Thr Val Thr Thr Ser Tyr Glu Glu Val Val Glu Ala Leu Arg Ala | |
| 1 5 10 15 | |
| Ser Leu Lys Glu Asn Glu Arg Leu Arg Arg Gly Arg Asp Arg Phe Ser | |
| 20 25 30 | |
| Ala Glu Lys Asp Asp Pro Ile Ala Ile Val Ala Met Ser Cys Arg Tyr | |
| 35 40 45 | |
| Pro Gly Gln Val Ser Ser Pro Glu Asp Leu Trp Gln Leu Ala Ala Gly | |
| 50 55 60 | |
| Gly Val Asp Ala Ile Ser Glu Val Pro Gly Asp Arg Gly Trp Asp Leu | |
| 65 70 75 80 | |
| Asp Gly Val Phe Val Pro Asp Ser Asp Arg Pro Gly Thr Ser Tyr Ala | |
| 85 90 95 | |
| Cys Ala Gly Gly Phe Leu Gln Gly Val Ser Glu Phe Asp Ala Gly Phe | |
| 100 105 110 | |
| Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg | |
| 115 120 125 | |
| Leu Leu Leu Glu Val Ala Trp Glu Val Phe Glu Arg Ala Gly Leu Glu | |
| 130 135 140 | |
| Gln Arg Ser Thr Arg Gly Ser Arg Val Gly Val Phe Val Gly Thr Asn | |
| 145 150 155 160 | |
| Gly Gln Asp Tyr Ala Ser Trp Leu Arg Thr Pro Pro Pro Ala Val Ala | |

| 165 | | | | | 170 | | | | | 175 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | His | Val | Leu | Thr | Gly | Gly | Ala | Ala | Ala | Val | Leu | Ser | Gly | Arg | Val |
| | | | 180 | | | | | 185 | | | | | 190 | | |
| Ala | Tyr | Ser | Phe | Gly | Phe | Glu | Gly | Pro | Ala | Val | Thr | Val | Asp | Thr | Ala |
| | | 195 | | | | | 200 | | | | | 205 | | | |
| Cys | Ser | Ser | Ser | Leu | Val | Ala | Leu | His | Leu | Ala | Gly | Gln | Ala | Leu | Arg |
| | 210 | | | | | 215 | | | | | 220 | | | | |
| Ala | Gly | Glu | Cys | Asp | Leu | Ala | Leu | Ala | Gly | Gly | Val | Thr | Val | Met | Ser |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 |
| Thr | Pro | Lys | Val | Phe | Leu | Glu | Phe | Ser | Arg | Gln | Arg | Gly | Leu | Ala | Pro |
| | | | | 245 | | | | | 250 | | | | | 255 | |
| Asp | Gly | Arg | Cys | Lys | Ser | Phe | Ala | Ala | Gly | Ala | Asp | Gly | Thr | Gly | Trp |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Gly | Glu | Gly | Ala | Gly | Leu | Leu | Leu | Leu | Glu | Arg | Leu | Ser | Asp | Ala | Arg |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Arg | Asn | Gly | His | Glu | Val | Leu | Ala | Val | Val | Arg | Gly | Ser | Ala | Val | Asn |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Gln | Asp | Gly | Ala | Ser | Asn | Gly | Leu | Thr | Ala | Pro | Asn | Gly | Ser | Ser | Gln |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Gln | Arg | Val | Ile | Thr | Gln | Ala | Leu | Ala | Ser | Ala | Gly | Leu | Ser | Val | Ser |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Asp | Val | Asp | Ala | Val | Glu | Ala | His | Gly | Thr | Gly | Thr | Arg | Leu | Gly | Asp |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Pro | Ile | Glu | Ala | Gln | Ala | Leu | Ile | Ala | Thr | Tyr | Gly | Arg | Asp | Arg | Asp |
| | | 355 | | | | 360 | | | | | | 365 | | | |
| Pro | Gly | Arg | Pro | Leu | Trp | Leu | Gly | Ser | Val | Lys | Ser | Asn | Ile | Gly | His |
| | 370 | | | | | 375 | | | | | 380 | | | | |
| Thr | Gln | Ala | Ala | Ala | Gly | Val | Ala | Gly | Val | Ile | Lys | Met | Val | Met | Ala |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 |
| Met | Arg | His | Gly | Gln | Leu | Pro | Arg | Thr | Leu | His | Val | Glu | Ser | Pro | Ser |
| | | | | 405 | | | | | 410 | | | | | 415 | |
| Pro | Glu | Val | Asp | Trp | Ser | Ala | Gly | Thr | Val | Gln | Leu | Leu | Thr | Glu | Asn |
| | | | 420 | | | | | 425 | | | | | 430 | | |
| Thr | Pro | Trp | Pro | Arg | Ser | Gly | Arg | Val | Arg | Arg | Val | Gly | Val | Ser | Ser |
| | | 435 | | | | | 440 | | | | | 445 | | | |
| Phe | Gly | Ile | Ser | Gly | Thr | Asn | Ala | His | Val | Ile | Leu | Glu | Gln | Pro | Pro |
| | 450 | | | | | 455 | | | | | 460 | | | | |
| Gly | Val | Pro | Ser | Gln | Ser | Ala | Gly | Pro | Gly | Ser | Gly | Ser | Val | Val | Asp |

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|-----------------------------------------------------------------|-----|-----|-----|-----|-----|-----|
| 465 | | 470 | | 475 | | 480 |
| Val Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala Leu | | | | | | |
| | 485 | | 490 | | 495 | |
| Ser Ala Gln Ala Thr Ala Leu Met Thr Tyr Leu Asp Glu Arg Pro Asp | | | | | | |
| | 500 | | 505 | | 510 | |
| Val Ser Ser Leu Asp Val Gly Tyr Ser Leu Ala Leu Thr Arg Ser Ala | | | | | | |
| | 515 | | 520 | | 525 | |
| Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Glu Thr Leu Leu | | | | | | |
| | 530 | | 535 | | 540 | |
| Cys Gly Val Lys Ala Leu Ser Ala Gly His Glu Ala Ser Gly Leu Val | | | | | | |
| | 545 | | 550 | | 555 | |
| Thr Gly Ser Val Gly Ala Gly Gly Arg Ile Gly Phe Val Phe Ser Gly | | | | | | |
| | 565 | | 570 | | 575 | |
| Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu Tyr Arg Ala Phe | | | | | | |
| | 580 | | 585 | | 590 | |
| Pro Val Phe Ala Ala Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala | | | | | | |
| | 595 | | 600 | | 605 | |
| His Leu Gly Gln Glu Ile Gly Val Arg Glu Val Val Ser Gly Ser Asp | | | | | | |
| | 610 | | 615 | | 620 | |
| Ala Gln Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser Gly Leu Phe Ala | | | | | | |
| | 625 | | 630 | | 635 | |
| Leu Gln Val Gly Leu Leu Lys Leu Leu Asp Ser Trp Gly Val Arg Pro | | | | | | |
| | 645 | | 650 | | 655 | |
| Ser Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe Ala | | | | | | |
| | 660 | | 665 | | 670 | |
| Ala Gly Val Val Ser Leu Ser Gly Ala Ala Arg Leu Val Ala Gly Arg | | | | | | |
| | 675 | | 680 | | 685 | |
| Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Gly Met Leu Ala Val | | | | | | |
| | 690 | | 695 | | 700 | |
| Pro Ala Gly Glu Glu Leu Leu Trp Ser Leu Leu Ala Asp Gln Gly Asp | | | | | | |
| | 705 | | 710 | | 715 | |
| Arg Val Gly Ile Ala Ala Val Asn Ala Ala Gly Ser Val Val Leu Ser | | | | | | |
| | 725 | | 730 | | 735 | |
| Gly Asp Arg Asp Val Leu Asp Asp Leu Ala Gly Arg Leu Asp Gly Gln | | | | | | |
| | 740 | | 745 | | 750 | |
| Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser Tyr | | | | | | |
| | 755 | | 760 | | 765 | |
| Arg Met Asp Pro Met Leu Ala Glu Phe Ala Glu Leu Ala Arg Thr Val | | | | | | |

| 770 | 775 | 780 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|
| Asp Tyr Arg Arg Cys Glu Val Pro Ile Val Ser Thr Leu Thr Gly Asp 785 790 795 800 | | |
| Leu Asp Asp Ala Gly Arg Met Ser Gly Pro Asp Tyr Trp Val Arg Gln 805 810 815 | | |
| Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Gln Ala Leu Val Glu 820 825 830 | | |
| His Asp Val Ala Thr Val Val Glu Leu Gly Pro Asp Gly Ala Leu Ser 835 840 845 | | |
| Ala Leu Ile Gln Glu Cys Val Ala Ala Ser Asp His Ala Gly Arg Leu 850 855 860 | | |
| Ser Ala Val Pro Ala Met Arg Arg Asn Gln Asp Glu Ala Gln Lys Val 865 870 875 880 | | |
| Met Thr Ala Leu Ala His Val His Val Arg Gly Gly Ala Val Asp Trp 885 890 895 | | |
| Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Ile Glu Leu Pro Thr 900 905 910 | | |
| Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Val Pro Ser Asp Ser Gly 915 920 925 | | |
| Asp Val Thr Gly Ala Gly Leu Ala Gly Ala Glu His Pro Leu Leu Gly 930 935 940 | | |
| Ala Val Val Pro Val Ala Gly Gly Asp Glu Val Leu Leu Thr Gly Arg 945 950 955 960 | | |
| Ile Ser Val Arg Thr His Pro Trp Leu Ala Glu His Arg Val Leu Gly 965 970 975 | | |
| Glu Val Ile Val Ala Gly Thr Ala Leu Leu Glu Ile Ala Leu His Ala 980 985 990 | | |
| Gly Glu Arg Leu Gly Cys Glu Arg Val Glu Glu Leu Thr Leu Glu Ala 995 1000 1005 | | |
| Pro Leu Val Leu Pro Glu Arg Gly Ala Ile Gln Val Gln Leu Arg Val 1010 1015 1020 | | |
| Gly Ala Pro Glu Asn Ser Gly Arg Arg Pro Met Ala Leu Tyr Ser Arg 1025 1030 1035 1040 | | |
| Pro Glu Gly Ala Ala Glu His Asp Trp Thr Arg His Ala Thr Gly Arg 1045 1050 1055 | | |
| Leu Ala Pro Gly Arg Gly Glu Ala Ala Gly Asp Leu Ala Asp Trp Pro 1060 1065 1070 | | |
| Ala Pro Gly Ala Leu Pro Val Asp Leu Asp Glu Phe Tyr Arg Asp Leu | | |

| 1075 | 1080 | 1085 |
|-------------------------------------------------------------------------|------|-----------|
| Ala Glu Leu Gly Leu Glu Tyr Gly Pro Ile Phe Gln Gly Leu Lys Ala 1090 | 1095 | 1100 |
| Ala Trp Arg Gln Gly Asp Glu Val Tyr Ala Glu Ala Ala Leu Pro Gly 1105 | 1110 | 1115 1120 |
| Thr Glu Asp Ser Gly Phe Gly Val His Pro Ala Leu Leu Asp Ala Ala 1125 | 1130 | 1135 |
| Leu His Ala Thr Ala Val Arg Asp Met Asp Asp Ala Arg Leu Pro Phe 1140 | 1145 | 1150 |
| Gln Trp Glu Gly Val Ser Leu His Ala Lys Ala Ala Pro Ala Leu Arg 1155 | 1160 | 1165 |
| Val Arg Val Val Pro Ala Gly Asp Asp Ala Lys Ser Leu Leu Val Cys 1170 | 1175 | 1180 |
| Asp Gly Thr Gly Arg Pro Val Ile Ser Val Asp Arg Leu Val Leu Arg 1185 | 1190 | 1195 1200 |
| Ser Ala Ala Ala Arg Arg Thr Gly Ala Arg Arg Gln Ala His Gln Ala 1205 | 1210 | 1215 |
| Arg Leu Tyr Arg Leu Ser Trp Pro Thr Val Gln Leu Pro Thr Ser Ala 1220 | 1225 | 1230 |
| Gln Pro Pro Ser Cys Val Leu Leu Gly Thr Ser Glu Val Ser Ala Asp 1235 | 1240 | 1245 |
| Ile Gln Val Tyr Pro Asp Leu Arg Ser Leu Thr Ala Ala Leu Asp Ala 1250 | 1255 | 1260 |
| Gly Ala Glu Pro Pro Gly Val Val Ile Ala Pro Thr Pro Pro Gly Gly 1265 | 1270 | 1275 1280 |
| Gly Arg Thr Ala Asp Val Arg Glu Thr Thr Arg His Ala Leu Asp Leu 1285 | 1290 | 1295 |
| Val Gln Gly Trp Leu Ser Asp Gln Arg Leu Asn Glu Ser Arg Leu Leu 1300 | 1305 | 1310 |
| Leu Val Thr Gln Gly Ala Val Ala Val Glu Pro Gly Glu Pro Val Thr 1315 | 1320 | 1325 |
| Asp Leu Ala Gln Ala Ala Leu Trp Gly Leu Leu Arg Ser Thr Gln Thr 1330 | 1335 | 1340 |
| Glu His Pro Asp Arg Phe Val Leu Val Asp Val Pro Glu Pro Ala Gln 1345 | 1350 | 1355 1360 |
| Leu Leu Pro Ala Leu Pro Gly Val Leu Ala Cys Gly Glu Pro Gln Leu 1365 | 1370 | 1375 |
| Ala Leu Arg Arg Gly Gly Ala His Ala Pro Arg Leu Ala Gly Leu Gly | | |

| 1380 | 1385 | 1390 |
|----------------------------------------------------------------------------------------|------|------|
| Ser Asp Asp Val Leu Pro Val Pro Asp Gly Thr Gly Trp Arg Leu Glu 1395 1400 1405 | | |
| Ala Thr Arg Pro Gly Ser Leu Asp Gly Leu Ala Leu Val Asp Glu Pro 1410 1415 1420 | | |
| Thr Ala Thr Ala Pro Leu Gly Asp Gly Glu Val Arg Ile Ala Met Arg 1425 1430 1435 1440 | | |
| Ala Ala Gly Val Asn Phe Arg Asp Ala Leu Ile Ala Leu Gly Met Tyr 1445 1450 1455 | | |
| Pro Gly Val Ala Ser Leu Gly Ser Glu Gly Ala Gly Val Val Val Glu 1460 1465 1470 | | |
| Thr Gly Pro Gly Val Thr Gly Leu Ala Pro Gly Asp Arg Val Met Gly 1475 1480 1485 | | |
| Met Ile Pro Lys Ala Phe Gly Pro Leu Ala Val Ala Asp His Arg Met 1490 1495 1500 | | |
| Val Thr Arg Ile Pro Ala Gly Trp Ser Phe Ala Arg Ala Ala Ser Val 1505 1510 1515 1520 | | |
| Pro Ile Val Phe Leu Thr Ala Tyr Tyr Ala Leu Val Asp Leu Ala Gly 1525 1530 1535 | | |
| Leu Arg Pro Gly Glu Ser Leu Leu Val His Ser Ala Ala Gly Gly Val 1540 1545 1550 | | |
| Gly Met Ala Ala Ile Gln Leu Ala Arg His Leu Gly Ala Glu Val Tyr 1555 1560 1565 | | |
| Ala Thr Ala Ser Glu Asp Lys Trp Gln Ala Val Glu Leu Ser Arg Glu 1570 1575 1580 | | |
| His Leu Ala Ser Ser Arg Thr Cys Asp Phe Glu Gln Gln Phe Leu Gly 1585 1590 1595 1600 | | |
| Ala Thr Gly Gly Arg Gly Val Asp Val Val Leu Asn Ser Leu Ala Gly 1605 1610 1615 | | |
| Glu Phe Ala Asp Ala Ser Leu Arg Met Leu Pro Arg Gly Gly Arg Phe 1620 1625 1630 | | |
| Leu Glu Leu Gly Lys Thr Asp Val Arg Asp Pro Val Glu Val Ala Asp 1635 1640 1645 | | |
| Ala His Pro Gly Val Ser Tyr Gln Ala Phe Asp Thr Val Glu Ala Gly 1650 1655 1660 | | |
| Pro Gln Arg Ile Gly Glu Met Leu His Glu Leu Val Glu Leu Phe Glu 1665 1670 1675 1680 | | |
| Gly Arg Val Leu Glu Pro Leu Pro Val Thr Ala Trp Asp Val Arg Gln | | |

| | | |
|-----------------------------------------------------------------|------|------|
| 1685 | 1690 | 1695 |
| Ala Pro Glu Ala Leu Arg His Leu Ser Gln Ala Arg His Val Gly Lys | | |
| 1700 | 1705 | 1710 |
| Leu Val Leu Thr Met Pro Pro Val Trp Asp Ala Ala Gly Thr Val Leu | | |
| 1715 | 1720 | 1725 |
| Val Thr Gly Gly Thr Gly Ala Leu Gly Ala Glu Val Ala Arg His Leu | | |
| 1730 | 1735 | 1740 |
| Val Ile Glu Arg Gly Val Arg Asn Leu Val Leu Val Ser Arg Arg Gly | | |
| 1745 | 1750 | 1755 |
| Pro Ala Ala Ser Gly Ala Ala Glu Leu Val Ala Gln Leu Thr Ala Tyr | | |
| 1765 | 1770 | 1775 |
| Gly Ala Glu Val Ser Leu Gln Ala Cys Asp Val Ala Asp Arg Glu Thr | | |
| 1780 | 1785 | 1790 |
| Leu Ala Lys Val Leu Ala Ser Ile Pro Asp Glu His Pro Leu Thr Ala | | |
| 1795 | 1800 | 1805 |
| Val Val His Ala Ala Gly Val Leu Asp Asp Gly Val Ser Glu Ser Leu | | |
| 1810 | 1815 | 1820 |
| Thr Val Glu Arg Leu Asp Gln Val Leu Arg Pro Lys Val Asp Gly Ala | | |
| 1825 | 1830 | 1835 |
| Arg Asn Leu Leu Glu Leu Ile Asp Pro Asp Val Ala Leu Val Leu Phe | | |
| 1845 | 1850 | 1855 |
| Ser Ser Val Ser Gly Val Leu Gly Ser Gly Gly Gln Gly Asn Tyr Ala | | |
| 1860 | 1865 | 1870 |
| Ala Ala Asn Ser Phe Leu Asp Ala Leu Ala Gln Gln Arg Gln Ser Arg | | |
| 1875 | 1880 | 1885 |
| Gly Leu Pro Thr Arg Ser Leu Ala Trp Gly Pro Trp Ala Glu His Gly | | |
| 1890 | 1895 | 1900 |
| Met Ala Ser Thr Leu Arg Glu Ala Glu Gln Asp Arg Leu Ala Arg Ser | | |
| 1905 | 1910 | 1915 |
| Gly Leu Leu Pro Ile Ser Thr Glu Glu Gly Leu Ser Gln Phe Asp Ala | | |
| 1925 | 1930 | 1935 |
| Ala Cys Gly Gly Ala His Thr Val Val Ala Pro Val Arg Phe Ser Arg | | |
| 1940 | 1945 | 1950 |
| Leu Ser Asp Gly Asn Ala Ile Lys Phe Ser Val Leu Gln Gly Leu Val | | |
| 1955 | 1960 | 1965 |
| Gly Pro His Arg Val Asn Lys Ala Ala Thr Ala Asp Asp Ala Glu Ser | | |
| 1970 | 1975 | 1980 |
| Leu Arg Lys Arg Leu Gly Arg Leu Pro Asp Ala Glu Gln His Arg Ile | | |

| 1985 | 1990 | 1995 | 2000 |
|-----------------------------------------------------------------|------|------|------|
| Leu Leu Asp Leu Val Arg Met His Val Ala Ala Val Leu Gly Phe Ala | 2005 | 2010 | 2015 |
| Gly Ser Gln Glu Ile Thr Ala Asp Gly Thr Phe Lys Val Leu Gly Phe | 2020 | 2025 | 2030 |
| Asp Ser Leu Thr Val Val Glu Leu Arg Asn Arg Ile Asn Gly Ala Thr | 2035 | 2040 | 2045 |
| Gly Leu Arg Leu Pro Ala Thr Leu Val Phe Asn Tyr Pro Thr Pro Asp | 2050 | 2055 | 2060 |
| Ala Leu Ala Ala His Leu Val Thr Ala Leu Ser Ala Asp Arg Leu Ala | 2065 | 2070 | 2075 |
| Gly Thr Phe Glu Glu Leu Asp Arg Trp Ala Ala Asn Leu Pro Thr Leu | 2085 | 2090 | 2095 |
| Ala Arg Asp Glu Ala Thr Arg Ala Gln Ile Thr Thr Arg Leu Gln Ala | 2100 | 2105 | 2110 |
| Ile Leu Gln Ser Leu Ala Asp Val Ser Gly Gly Thr Gly Gly Gly Ser | 2115 | 2120 | 2125 |
| Val Pro Asp Arg Leu Arg Ser Ala Thr Asp Asp Glu Leu Phe Gln Leu | 2130 | 2135 | 2140 |
| Leu Asp Asn Asp Leu Glu Leu Pro | 2145 | 2150 | |

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 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
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 <223> ORF20; polyketide synthase

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| Met Ser Asn Glu Glu Lys Leu Arg Glu Tyr Leu Arg Arg Ala Leu Val | |
| 1 5 10 15 | |
| gat ctg cac cag gcg cgc gag cgg ctg cac gag gcg gag tcg gga gag | 96 |
| Asp Leu His Gln Ala Arg Glu Arg Leu His Glu Ala Glu Ser Gly Glu | |
| 20 25 30 | |
| cgg gaa ccc atc gcg atc gtg gcg atg ggc tgc cgg tac ccg ggt ggg | 144 |
| Arg Glu Pro Ile Ala Ile Val Ala Met Gly Cys Arg Tyr Pro Gly Gly | |
| 35 40 45 | |

| | |
|-----------------------------------------------------------------|-----|
| gtg cag gac ccg gaa ggg ctg tgg aaa ctg gtc gcc tcc ggt ggc gac | 192 |
| Val Gln Asp Pro Glu Gly Leu Trp Lys Leu Val Ala Ser Gly Gly Asp | |
| 50 55 60 | |
| gcc atc ggt gaa ttc ccc gct gat cgt ggt tgg cac ctc gac gag ctc | 240 |
| Ala Ile Gly Glu Phe Pro Ala Asp Arg Gly Trp His Leu Asp Glu Leu | |
| 65 70 75 80 | |
| tac gat ccc gac ccg gat cag ccc gga acc tgc tac acc cgg cac ggc | 288 |
| Tyr Asp Pro Asp Pro Asp Gln Pro Gly Thr Cys Tyr Thr Arg His Gly | |
| 85 90 95 | |
| ggc ttc ctc cac gac gcc ggc gag ttc gac gcg gga ttc ttc gac atc | 336 |
| Gly Phe Leu His Asp Ala Gly Glu Phe Asp Ala Gly Phe Phe Asp Ile | |
| 100 105 110 | |
| agc ccc cgt gag gcg ctc gcg atg gac ccg cag cag cgg ctg ctg ctg | 384 |
| Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu | |
| 115 120 125 | |
| gaa atc tcc tgg gag acc gtc gaa tcc gct ggg atg gac ccg agg tcc | 432 |
| Glu Ile Ser Trp Glu Thr Val Glu Ser Ala Gly Met Asp Pro Arg Ser | |
| 130 135 140 | |
| ttg cgg ggg agc cgc acc ggg gtg ttc gcg gga ttg atg tac gag ggc | 480 |
| Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met Tyr Glu Gly | |
| 145 150 155 160 | |
| tat gac acc ggc gcc cac cgg gca gga gaa ggt gtc gaa ggc tat ctc | 528 |
| Tyr Asp Thr Gly Ala His Arg Ala Gly Glu Gly Val Glu Gly Tyr Leu | |
| 165 170 175 | |
| gga acc ggc aat gcg gga agc gtc gcc tct ggt cgg gtt gcg tat gcg | 576 |
| Gly Thr Gly Asn Ala Gly Ser Val Ala Ser Gly Arg Val Ala Tyr Ala | |
| 180 185 190 | |
| ttc ggg ttc gag ggc cca gcg gtg acg gta gac acg gcg tgc tcg tcg | 624 |
| Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser | |
| 195 200 205 | |
| tcg ttg gtg gcg ctg cat ttg gcg tgt cag tcg ttg cgg cag ggc gag | 672 |
| Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Gln Gly Glu | |
| 210 215 220 | |
| tgt gat ctg gcg ctg gcc ggt gga gtg acg gtg atg tcg acg ccg gag | 720 |
| Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ser Thr Pro Glu | |
| 225 230 235 240 | |
| agg ttc gtg gag ttc tcc cgt cag cgt ggt ctc gca ccg gat ggg cgg | 768 |
| Arg Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg | |
| 245 250 255 | |
| tgt aag tcg ttc gcg gcg gct gcg gat gga acc ggt tgg ggt gag ggt | 816 |
| Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly | |
| 260 265 270 | |
| gcc ggt ttg gtg ttg ctg gag cgg ctg tca gac gcc agg cgg aac ggg | 864 |

| | |
|-----------------------------------------------------------------|------|
| Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly | |
| 275 280 285 | |
| cat cgg gta ctg gcg gtt gtt cgt ggt agc gcg gtg aat cag gac ggt | 912 |
| His Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly | |
| 290 295 300 | |
| gcg tcg aac gga ttg acg gcc ccg aac ggg ctg gcc cag gag cgg gtc | 960 |
| Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Leu Ala Gln Glu Arg Val | |
| 305 310 315 320 | |
| att cag cag gtg ctc acg agt gcg ggg ctg tcg gcg tcc gat gtg gac | 1008 |
| Ile Gln Gln Val Leu Thr Ser Ala Gly Leu Ser Ala Ser Asp Val Asp | |
| 325 330 335 | |
| gct gtg gag gcg cat gga acg ggt acg cgg ctt ggt gat ccg atc gag | 1056 |
| Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly Asp Pro Ile Glu | |
| 340 345 350 | |
| gcg cag gct ctg ata gcc gcc tat gga cag gat cgg gac cgg gac cgg | 1104 |
| Ala Gln Ala Leu Ile Ala Ala Tyr Gly Gln Asp Arg Asp Arg Asp Arg | |
| 355 360 365 | |
| ccg ctg tgg ttg ggg tcg gtc aag tcc aac atc ggt cat acg cag gcg | 1152 |
| Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His Thr Gln Ala | |
| 370 375 380 | |
| gct gcg ggc gtc gct ggt gtg atc aag atg gtc atg gcg atg cgg cac | 1200 |
| Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met Ala Met Arg His | |
| 385 390 395 400 | |
| ggg gag ctg ccg cgc acg ttg cac gtg gac gag ccg aat tcg cac gtg | 1248 |
| Gly Glu Leu Pro Arg Thr Leu His Val Asp Glu Pro Asn Ser His Val | |
| 405 410 415 | |
| gac tgg tcg gct ggt gcg gtc cga ctc ctg acc gag aac atc cgc tgg | 1296 |
| Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Glu Asn Ile Arg Trp | |
| 420 425 430 | |
| cca ggg acg ggt acg cgc cgc gct gga gtg tcg tcg ttc ggg gta agc | 1344 |
| Pro Gly Thr Gly Thr Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser | |
| 435 440 445 | |
| ggt acc aac gca cac gtc atc ctc gaa cac gac ccg ctc gcc gtg acc | 1392 |
| Gly Thr Asn Ala His Val Ile Leu Glu His Asp Pro Leu Ala Val Thr | |
| 450 455 460 | |
| gag aac gag gaa gca gcg cag tcc cca gca cct ggg atc gtg ccc tgg | 1440 |
| Glu Asn Glu Glu Ala Ala Gln Ser Pro Ala Pro Gly Ile Val Pro Trp | |
| 465 470 475 480 | |
| gcg ttg tcc ggg cgg tcg tcg acg gcg ctg cgg gcc cag gcc gaa cgg | 1488 |
| Ala Leu Ser Gly Arg Ser Ser Thr Ala Leu Arg Ala Gln Ala Glu Arg | |
| 485 490 495 | |
| ctg cgc gag ctg tgc gag cag acc gat ccc gac ccc gtc gat gtc ggt | 1536 |
| Leu Arg Glu Leu Cys Glu Gln Thr Asp Pro Asp Pro Val Asp Val Gly | |

| 500 | | | | | | 505 | | | | | | 510 | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|
| ttc | tca | ctg | gcc | gcc | acg | cgc | acg | gct | tgg | gag | cac | cga | gcg | gtg | gtg | 1584 | | |
| Phe | Ser | Leu | Ala | Ala | Thr | Arg | Thr | Ala | Trp | Glu | His | Arg | Ala | Val | Val | | | |
| 515 | | | | | | 520 | | | | | | 525 | | | | | | |
| ctt | ggt | cgg | gac | agc | gct | acg | ttg | cgc | tcc | ggg | ctt | ggc | gtt | gtt | gcc | 1632 | | |
| Leu | Gly | Arg | Asp | Ser | Ala | Thr | Leu | Arg | Ser | Gly | Leu | Gly | Val | Val | Ala | | | |
| 530 | | | | | | 535 | | | | | | 540 | | | | | | |
| agc | ggt | gaa | cca | gcg | gtc | gat | gtc | gtt | gag | ggg | agc | gtc | ctg | gac | ggc | 1680 | | |
| Ser | Gly | Glu | Pro | Ala | Val | Asp | Val | Val | Glu | Gly | Ser | Val | Leu | Asp | Gly | | | |
| 545 | | | 550 | | | | | | 555 | | | 560 | | | | | | |
| gag | gtc | gtc | ttc | gtc | ttc | ccc | ggt | cag | ggc | tgg | cag | tgg | gcc | ggt | atg | 1728 | | |
| Glu | Val | Val | Phe | Val | Phe | Pro | Gly | Gln | Gly | Trp | Gln | Trp | Ala | Gly | Met | | | |
| | | | 565 | | | | | | 570 | | | 575 | | | | | | |
| gca | gtc | gac | ctg | ctg | gac | gct | tcg | ccg | acg | ttc | gcg | cgc | cac | atg | gac | 1776 | | |
| Ala | Val | Asp | Leu | Leu | Asp | Ala | Ser | Pro | Thr | Phe | Ala | Arg | His | Met | Asp | | | |
| | | | 580 | | | 585 | | | | | | 590 | | | | | | |
| gag | tgc | gcc | acc | gcg | ctg | cgg | agg | tac | gtg | gac | tgg | tcg | ttg | gtc | gac | 1824 | | |
| Glu | Cys | Ala | Thr | Ala | Leu | Arg | Arg | Tyr | Val | Asp | Trp | Ser | Leu | Val | Asp | | | |
| 595 | | | | | | 600 | | | | | | 605 | | | | | | |
| gtg | ctg | cgc | gga | gcg | gag | aac | tcc | cca | ccg | ctg | gac | cgg | gtg | gac | gtg | 1872 | | |
| Val | Leu | Arg | Gly | Ala | Glu | Asn | Ser | Pro | Pro | Leu | Asp | Arg | Val | Asp | Val | | | |
| 610 | | | | | | 615 | | | | | | 620 | | | | | | |
| ctc | cag | ccc | gcg | tcc | ttc | gcg | gtg | atg | gtg | tcg | ctc | gcc | gag | gtg | tgg | 1920 | | |
| Leu | Gln | Pro | Ala | Ser | Phe | Ala | Val | Met | Val | Ser | Leu | Ala | Glu | Val | Trp | | | |
| 625 | | | 630 | | | | | | 635 | | | 640 | | | | | | |
| cgt | tcc | tac | ggg | gtg | agg | ccg | gcg | gcc | gtc | gtc | ggc | cac | agt | caa | ggc | 1968 | | |
| Arg | Ser | Tyr | Gly | Val | Arg | Pro | Ala | Ala | Val | Val | Gly | His | Ser | Gln | Gly | | | |
| | | | 645 | | | | | | 650 | | | 655 | | | | | | |
| gaa | atc | gcc | gcg | gcc | tgc | gca | gcc | ggg | gtg | ctg | ccg | ctg | gag | gat | gcg | 2016 | | |
| Glu | Ile | Ala | Ala | Ala | Cys | Ala | Ala | Gly | Val | Leu | Pro | Leu | Glu | Asp | Ala | | | |
| 660 | | | | | | 665 | | | | | | 670 | | | | | | |
| gcc | agg | ctt | gtc | gca | ttg | cgc | agc | aga | gcg | ttg | aag | gga | ctt | tcg | ggg | 2064 | | |
| Ala | Arg | Leu | Val | Ala | Leu | Arg | Ser | Arg | Ala | Leu | Lys | Gly | Leu | Ser | Gly | | | |
| 675 | | | | | | 680 | | | | | | 685 | | | | | | |
| cgg | ggt | ggc | atg | gcg | tcg | ctg | gcc | tgc | cct | gcg | gat | gag | gtc | gcg | gca | 2112 | | |
| Arg | Gly | Gly | Met | Ala | Ser | Leu | Ala | Cys | Pro | Ala | Asp | Glu | Val | Ala | Ala | | | |
| 690 | | | | | | 695 | | | | | | 700 | | | | | | |
| ttg | ttc | gcg | gga | tcg | ggc | ggc | cgt | ctg | gaa | gtt | gcg | gcg | atc | aac | ggc | 2160 | | |
| Leu | Phe | Ala | Gly | Ser | Gly | Gly | Arg | Leu | Glu | Val | Ala | Ala | Ile | Asn | Gly | | | |
| 705 | | | 710 | | | | | | 715 | | | 720 | | | | | | |
| ccg | cga | tcg | gtc | gtg | gtg | tcc | ggc | gat | ctg | gaa | gcg | gtg | gac | gaa | ctg | 2208 | | |
| Pro | Arg | Ser | Val | Val | Val | Ser | Gly | Asp | Leu | Glu | Ala | Val | Asp | Glu | Leu | | | |
| | | | 725 | | | | | | 730 | | | 735 | | | | | | |

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|-----------------------------------------------------------------|------|
| ctg gca gag tgc gct gaa aag gac atg cgt gca cgc cgt atc ccc gtc | 2256 |
| Leu Ala Glu Cys Ala Glu Lys Asp Met Arg Ala Arg Arg Ile Pro Val | |
| 740 745 750 | |
| gac tac gcc tcg cat tca gcg cac gtg gag gtg gtt cgg agc ccg gtg | 2304 |
| Asp Tyr Ala Ser His Ser Ala His Val Glu Val Val Arg Ser Pro Val | |
| 755 760 765 | |
| ctg gcg gcc gcc gcc ggg gtg cga cac cgg gac ggc cag gtg ccg tgg | 2352 |
| Leu Ala Ala Ala Ala Gly Val Arg His Arg Asp Gly Gln Val Pro Trp | |
| 770 775 780 | |
| tgg tcg acg gtg atc ggc gac tgg gtg gat ccg gcc agg ctg gac ggc | 2400 |
| Trp Ser Thr Val Ile Gly Asp Trp Val Asp Pro Ala Arg Leu Asp Gly | |
| 785 790 795 800 | |
| gag tat tgg tat cgg aac ctc cgg cag ccg gtc cgg ttc gaa cac gcc | 2448 |
| Glu Tyr Trp Tyr Arg Asn Leu Arg Gln Pro Val Arg Phe Glu His Ala | |
| 805 810 815 | |
| gtg cag ggc ctg gtc gag cgg gga ttc ggc ctg ttc atc gaa atg agt | 2496 |
| Val Gln Gly Leu Val Glu Arg Gly Phe Gly Leu Phe Ile Glu Met Ser | |
| 820 825 830 | |
| gcg cat ccg gtg ctg acc acg gcg gtc gag gaa acc ggt gcg gag tcg | 2544 |
| Ala His Pro Val Leu Thr Thr Ala Val Glu Glu Thr Gly Ala Glu Ser | |
| 835 840 845 | |
| gag acc gcc gtg gcc gcg gta ggt acc ttg cga cgt gac tcg ggc ggc | 2592 |
| Glu Thr Ala Val Ala Ala Val Gly Thr Leu Arg Arg Asp Ser Gly Gly | |
| 850 855 860 | |
| ctc cgg agg ttg ttg cat tcg ctg gcc gag gcg tac gtg cgc ggc gcc | 2640 |
| Leu Arg Arg Leu Leu His Ser Leu Ala Glu Ala Tyr Val Arg Gly Ala | |
| 865 870 875 880 | |
| acc gtg gac tgg gcc gtg gcg ttc ggg ggc gcg ggc cga ccg ctg gac | 2688 |
| Thr Val Asp Trp Ala Val Ala Phe Gly Gly Ala Gly Arg Arg Leu Asp | |
| 885 890 895 | |
| ctg ccg acc tac ccg ttc cag cgc cag ccg tac tgg ctg gac aag gga | 2736 |
| Leu Pro Thr Tyr Pro Phe Gln Arg Gln Arg Tyr Trp Leu Asp Lys Gly | |
| 900 905 910 | |
| gct gcc tcc gac gag gct cgt gcg gtc tcg gac ccg gcg gcg ggc tgg | 2784 |
| Ala Ala Ser Asp Glu Ala Arg Ala Val Ser Asp Pro Ala Ala Gly Trp | |
| 915 920 925 | |
| ttc tgg caa gcc gtg gcg cgc caa gac ctg aaa agc gtg tcc gat gcc | 2832 |
| Phe Trp Gln Ala Val Ala Arg Gln Asp Leu Lys Ser Val Ser Asp Ala | |
| 930 935 940 | |
| ctc gat ctc gac gcc gac gca ccg ctg agc gca aca ctt cca gcc ctg | 2880 |
| Leu Asp Leu Asp Ala Asp Ala Pro Leu Ser Ala Thr Leu Pro Ala Leu | |
| 945 950 955 960 | |

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|-----------------------------------------------------------------|------|
| tcc gtc tgg cac cgt cag gaa cga gaa agg gtc ttg gca gac ggt tgg | 2928 |
| Ser Val Trp His Arg Gln Glu Arg Glu Arg Val Leu Ala Asp Gly Trp | |
| 965 970 975 | |
| cgg tac cga gtc gac tgg gta cgg gtg gcc ccg cag ccg gtc cgg aga | 2976 |
| Arg Tyr Arg Val Asp Trp Val Arg Val Ala Pro Gln Pro Val Arg Arg | |
| 980 985 990 | |
| acg cgg gaa acc tgg ctc ctg gtc gtt ccc ccg ggc ggc atc gag gaa | 3024 |
| Thr Arg Glu Thr Trp Leu Leu Val Val Pro Pro Gly Gly Ile Glu Glu | |
| 995 1000 1005 | |
| gcg ctg gtc gaa cgg ctg acg gat gcg ttg aac acg cga ggg atc agc | 3072 |
| Ala Leu Val Glu Arg Leu Thr Asp Ala Leu Asn Thr Arg Gly Ile Ser | |
| 1010 1015 1020 | |
| acc ctg cgc ctc gac gtg cca ccg gcg gcg acc agt ggc gaa ctc gca | 3120 |
| Thr Leu Arg Leu Asp Val Pro Pro Ala Ala Thr Ser Gly Glu Leu Ala | |
| 1025 1030 1035 1040 | |
| acc gaa ctc cgc gcc gca gcc gac ggt gac ccg gtg aag gca atc ctg | 3168 |
| Thr Glu Leu Arg Ala Ala Ala Asp Gly Asp Pro Val Lys Ala Ile Leu | |
| 1045 1050 1055 | |
| tcg ctc acc gcg ttg gac gag cga ccc cac ccc gaa tgc aag gac gtc | 3216 |
| Ser Leu Thr Ala Leu Asp Glu Arg Pro His Pro Glu Cys Lys Asp Val | |
| 1060 1065 1070 | |
| ccg agc ggg att gcc ttg ctg ctg aac ctg gtc aag gcg ctc ggt gaa | 3264 |
| Pro Ser Gly Ile Ala Leu Leu Leu Asn Leu Val Lys Ala Leu Gly Glu | |
| 1075 1080 1085 | |
| gcc gac ctc aga att cct ctg tgg acc atc acg cgt ggt gcg gtc aag | 3312 |
| Ala Asp Leu Arg Ile Pro Leu Trp Thr Ile Thr Arg Gly Ala Val Lys | |
| 1090 1095 1100 | |
| gca ggc ccc gca gat cgg ctg ctg cgc ccg atg cag gcg caa gca tgg | 3360 |
| Ala Gly Pro Ala Asp Arg Leu Leu Arg Pro Met Gln Ala Gln Ala Trp | |
| 1105 1110 1115 1120 | |
| ggg ctg ggg cga gta gcc gca ctc gaa cac ccc gag cgc tgg ggt ggg | 3408 |
| Gly Leu Gly Arg Val Ala Ala Leu Glu His Pro Glu Arg Trp Gly Gly | |
| 1125 1130 1135 | |
| ctg atc gac ctg ccg gat tcg ctg gac ggc gac gtc ctc acg agg ctg | 3456 |
| Leu Ile Asp Leu Pro Asp Ser Leu Asp Gly Asp Val Leu Thr Arg Leu | |
| 1140 1145 1150 | |
| ggc gaa gcg ctc acc aac ggc ttg gcg gaa gac caa ctg gcg att cgc | 3504 |
| Gly Glu Ala Leu Thr Asn Gly Leu Ala Glu Asp Gln Leu Ala Ile Arg | |
| 1155 1160 1165 | |
| cag tcg ggc gtg ctg gcc cgg cga ctg gta ccc gcc ccg gcg aat cag | 3552 |
| Gln Ser Gly Val Leu Ala Arg Arg Leu Val Pro Ala Pro Ala Asn Gln | |
| 1170 1175 1180 | |
| ccc gct gga cgt aag tgg cgc ccc cga ggg agc gcg ctg atc acg ggc | 3600 |

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|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Pro | Ala | Gly | Arg | Lys | Trp | Arg | Pro | Arg | Gly | Ser | Ala | Leu | Ile | Thr | Gly | |
| 1185 | | | | | 1190 | | | | | 1195 | | | | | 1200 | |
| gga | ctc | ggc | gcg | gtg | ggc | gca | cag | gtg | gcg | agg | tgg | ttg | gcc | gaa | atc | 3648 |
| Gly | Leu | Gly | Ala | Val | Gly | Ala | Gln | Val | Ala | Arg | Trp | Leu | Ala | Glu | Ile | |
| | | | | 1205 | | | | | 1210 | | | | | 1215 | | |
| gga | gcc | gag | cga | atc | gtg | ctc | acc | agt | cga | cgg | ggc | aac | caa | gca | gca | 3696 |
| Gly | Ala | Glu | Arg | Ile | Val | Leu | Thr | Ser | Arg | Arg | Gly | Asn | Gln | Ala | Ala | |
| | | | 1220 | | | | | 1225 | | | | | 1230 | | | |
| ggc | gcc | gcc | gag | ctg | gaa | gcc | gaa | ctc | cgg | gcc | ctt | gga | gcg | caa | gtg | 3744 |
| Gly | Ala | Ala | Glu | Leu | Glu | Ala | Glu | Leu | Arg | Ala | Leu | Gly | Ala | Gln | Val | |
| | | 1235 | | | | | 1240 | | | | | 1245 | | | | |
| tcc | atc | gtg | gct | tgc | gac | gtg | acc | gat | cgt | gcc | gag | atg | tcc | gca | cta | 3792 |
| Ser | Ile | Val | Ala | Cys | Asp | Val | Thr | Asp | Arg | Ala | Glu | Met | Ser | Ala | Leu | |
| | 1250 | | | | | 1255 | | | | | 1260 | | | | | |
| ctg | gcc | gag | ttc | gac | gtc | acc | gcg | gtg | ttc | cac | gcg | gcc | gga | gtc | ggc | 3840 |
| Leu | Ala | Glu | Phe | Asp | Val | Thr | Ala | Val | Phe | His | Ala | Ala | Gly | Val | Gly | |
| 1265 | | | | | 1270 | | | | 1275 | | | | | 1280 | | |
| cgg | ctg | ctg | ccg | ttg | gcg | gag | acc | gac | cag | aac | ggc | ctg | gcc | gaa | ata | 3888 |
| Arg | Leu | Leu | Pro | Leu | Ala | Glu | Thr | Asp | Gln | Asn | Gly | Leu | Ala | Glu | Ile | |
| | | | 1285 | | | | | | 1290 | | | | | 1295 | | |
| tgc | gcg | gcg | aag | gtc | cgc | ggc | gct | cag | gtg | ctg | gac | gaa | ctg | tgc | gac | 3936 |
| Cys | Ala | Ala | Lys | Val | Arg | Gly | Ala | Gln | Val | Leu | Asp | Glu | Leu | Cys | Asp | |
| | | 1300 | | | | | | 1305 | | | | | 1310 | | | |
| agc | acc | gat | ctc | gat | gcc | ttc | gtc | ctg | ttc | tcc | tcc | ggc | ggc | ggg | gta | 3984 |
| Ser | Thr | Asp | Leu | Asp | Ala | Phe | Val | Leu | Phe | Ser | Ser | Gly | Ala | Gly | Val | |
| | 1315 | | | | | | 1320 | | | | | 1325 | | | | |
| tgg | ggc | ggg | ggc | ggc | cag | ggc | gct | tac | ggc | gcg | gcg | aac | gca | ttc | ttg | 4032 |
| Trp | Gly | Gly | Gly | Gly | Gln | Gly | Ala | Tyr | Gly | Ala | Ala | Asn | Ala | Phe | Leu | |
| | 1330 | | | | | 1335 | | | | 1340 | | | | | | |
| gac | aca | ctc | gcc | gaa | caa | cgc | cga | gca | cgc | ggc | ctg | ccg | gca | acc | tcg | 4080 |
| Asp | Thr | Leu | Ala | Glu | Gln | Arg | Arg | Ala | Arg | Gly | Leu | Pro | Ala | Thr | Ser | |
| 1345 | | | | 1350 | | | | | 1355 | | | | | 1360 | | |
| atc | tcc | tgg | ggc | agt | tgg | gcc | ggc | ggc | ggc | atg | gcc | gac | ggc | gcg | gcg | 4128 |
| Ile | Ser | Trp | Gly | Ser | Trp | Ala | Gly | Gly | Gly | Met | Ala | Asp | Gly | Ala | Ala | |
| | | | 1365 | | | | | 1370 | | | | | 1375 | | | |
| ggc | gaa | cac | ctg | cgg | cga | cgc | ggg | ata | cgt | ccg | atg | ccg | gcg | gcg | tcg | 4176 |
| Gly | Glu | His | Leu | Arg | Arg | Arg | Gly | Ile | Arg | Pro | Met | Pro | Ala | Ala | Ser | |
| | | 1380 | | | | | 1385 | | | | | 1390 | | | | |
| gcc | atc | ctg | gct | ctg | cag | gaa | gta | ctt | gac | cag | gat | gag | | | | |

| 1410 | 1415 | 1420 | |
|-----------------------------------------------------------------|------|------|------|
| act cgc gcc acc cgg ttg ttc gac gaa gtg ccg gcg gcg aga aag gcg | | | 4320 |
| Thr Arg Ala Thr Arg Leu Phe Asp Glu Val Pro Ala Ala Arg Lys Ala | | | |
| 1425 | 1430 | 1435 | 1440 |
| atg ccc gcg aat ggg ccg gca gaa cca ggc ggc tcg ccg ttc gcc cgc | | | 4368 |
| Met Pro Ala Asn Gly Pro Ala Glu Pro Gly Gly Ser Pro Phe Ala Arg | | | |
| 1445 | 1450 | 1455 | |
| aat ctc gcg gag ctg ccg gaa gcc caa cga cgc cac gaa ctg gtg gat | | | 4416 |
| Asn Leu Ala Glu Leu Pro Glu Ala Gln Arg Arg His Glu Leu Val Asp | | | |
| 1460 | 1465 | 1470 | |
| ctg gtg tgc gcc cag gtg gca acc gtg ctc ggg cac ggc agt cgc gag | | | 4464 |
| Leu Val Cys Ala Gln Val Ala Thr Val Leu Gly His Gly Ser Arg Glu | | | |
| 1475 | 1480 | 1485 | |
| gaa gtc cag ccc gag ccg gcg ttc cgc gcg ctc ggg ttc gac tcc ctc | | | 4512 |
| Glu Val Gln Pro Glu Arg Ala Phe Arg Ala Leu Gly Phe Asp Ser Leu | | | |
| 1490 | 1495 | 1500 | |
| atg gcg gtg gat ctg cgc aat cgt ttg acc acc gcc acc ggg ttg cgc | | | 4560 |
| Met Ala Val Asp Leu Arg Asn Arg Leu Thr Thr Ala Thr Gly Leu Arg | | | |
| 1505 | 1510 | 1515 | 1520 |
| ctg ccg acc aca acc gtc ttc gac tac ccg aat ccg gcc gcc ttg gcc | | | 4608 |
| Leu Pro Thr Thr Thr Val Phe Asp Tyr Pro Asn Pro Ala Ala Leu Ala | | | |
| 1525 | 1530 | 1535 | |
| gct cac ctg ctc gag gag ctg gtg ggt gat gtc gcg tcg gct gcg gtg | | | 4656 |
| Ala His Leu Leu Glu Glu Leu Val Gly Asp Val Ala Ser Ala Ala Val | | | |
| 1540 | 1545 | 1550 | |
| acc gct gcc agc gcg ccc gcg agt gac gaa ccg atc gcg atc gtc gcg | | | 4704 |
| Thr Ala Ala Ser Ala Pro Ala Ser Asp Glu Pro Ile Ala Ile Val Ala | | | |
| 1555 | 1560 | 1565 | |
| atg agc tgc ccg ttt ccg ggt ggc gcg cac tcg ccg gaa gac ctg tgg | | | 4752 |
| Met Ser Cys Arg Phe Pro Gly Gly Ala His Ser Pro Glu Asp Leu Trp | | | |
| 1570 | 1575 | 1580 | |
| ccg ctg gtc gcc gcc ggc acg gag gtg atc ggc gag ttc ccc tcc gac | | | 4800 |
| Arg Leu Val Ala Ala Gly Thr Glu Val Ile Gly Glu Phe Pro Ser Asp | | | |
| 1585 | 1590 | 1595 | 1600 |
| ccg ggc tgg gat gcg gaa ggc ctt tac gat ccg gat gct tcc agg cct | | | 4848 |
| Arg Gly Trp Asp Ala Glu Gly Leu Tyr Asp Pro Asp Ala Ser Arg Pro | | | |
| 1605 | 1610 | 1615 | |
| gga acg acg tat gcg ccg atg gcg gga ttc ctc tac gac gcc ggt gag | | | 4896 |
| Gly Thr Thr Tyr Ala Arg Met Ala Gly Phe Leu Tyr Asp Ala Gly Glu | | | |
| 1620 | 1625 | 1630 | |
| ttc gat gcc gac ctg ttc ggc atc agc cca cgt gag gcg ttg gcg atg | | | 4944 |
| Phe Asp Ala Asp Leu Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met | | | |
| 1635 | 1640 | 1645 | |

| | |
|-----------------------------------------------------------------|------|
| gat ccg cag cag cgg ttg gtg ctc gaa atc gcc tgg gaa gcc ctc gaa | 4992 |
| Asp Pro Gln Gln Arg Leu Val Leu Glu Ile Ala Trp Glu Ala Leu Glu | |
| 1650 1655 1660 | |
| cgg gcc gga atc gat ccg ttg tcc ttg aag ggc agt ggg gtc ggc acg | 5040 |
| Arg Ala Gly Ile Asp Pro Leu Ser Leu Lys Gly Ser Gly Val Gly Thr | |
| 1665 1670 1675 1680 | |
| tac atc ggc gct gga agc cgt ggg tac gcg acg gat gtg cgg cag ttt | 5088 |
| Tyr Ile Gly Ala Gly Ser Arg Gly Tyr Ala Thr Asp Val Arg Gln Phe | |
| 1685 1690 1695 | |
| ccc gag gag gcg gag ggc tac ctg ctg acg ggt acc tcg gcc agt gtg | 5136 |
| Pro Glu Glu Ala Glu Gly Tyr Leu Leu Thr Gly Thr Ser Ala Ser Val | |
| 1700 1705 1710 | |
| ctg tcg ggt cgg gtc gcg tat tcg ttt ggt ttc gag ggt cct gcg gtg | 5184 |
| Leu Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val | |
| 1715 1720 1725 | |
| acg gtg gat acg gct tgt tcg tcg tcg ttg gtg gcg ttg cat ctg gcg | 5232 |
| Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala | |
| 1730 1735 1740 | |
| tgc cag tcg ttg cgt tcg ggc gag tgt gat ctg gcg ttg gcc ggt ggt | 5280 |
| Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly | |
| 1745 1750 1755 1760 | |
| gtg acc gtg atg tcg acg ccg gag atg ttc gtg gag ttc tcc cgt cag | 5328 |
| Val Thr Val Met Ser Thr Pro Glu Met Phe Val Glu Phe Ser Arg Gln | |
| 1765 1770 1775 | |
| cgc ggt ttg gcg ccg gat ggg cgg tgc aag tcg ttc gcg gag agc gcg | 5376 |
| Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala | |
| 1780 1785 1790 | |
| gac ggc acc ggc tgg ggc gaa ggc gcg ggc ctg ttg ttg ctg gag cgg | 5424 |
| Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Leu Leu Glu Arg | |
| 1795 1800 1805 | |
| ttg tcg gac gcc cac cgg aat ggg cat cgg gtg ttg gcg gtg gtt cgt | 5472 |
| Leu Ser Asp Ala His Arg Asn Gly His Arg Val Leu Ala Val Val Arg | |
| 1810 1815 1820 | |
| ggg tca gcg gtg aat cag gac ggc gcc tcg aac gga ctg gcg gcg ccg | 5520 |
| Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ala Ala Pro | |
| 1825 1830 1835 1840 | |
| aac ggt ccg tcg cag cag cgg gtg atc aac cag gca ctc gcg aat gcg | 5568 |
| Asn Gly Pro Ser Gln Gln Arg Val Ile Asn Gln Ala Leu Ala Asn Ala | |
| 1845 1850 1855 | |
| gct ctt tcg gcg tcc gat gtg gat gcg gtg gag gca cat ggc acc ggg | 5616 |
| Ala Leu Ser Ala Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly | |
| 1860 1865 1870 | |

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|-----------------------------------------------------------------|------|
| acc agg ctg ggt gat ccg atc gag gcg cag gca ttg atc gca acg tat | 5664 |
| Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr | |
| 1875 1880 1885 | |
| ggg cag gcc cgg gag cgg gat cgg ccc ttg tgg ctg ggg tcg gtc aag | 5712 |
| Gly Gln Ala Arg Glu Arg Asp Arg Pro Leu Trp Leu Gly Ser Val Lys | |
| 1890 1895 1900 | |
| tcg aac atc ggt cat acg cag gcc gcg gcg ggt gtt gcc ggt gtg atc | 5760 |
| Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile | |
| 1905 1910 1915 1920 | |
| aag atg gtg atg gcc atg cgg cac ggg cag ctg ccc gcc tcg ctg cac | 5808 |
| Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro Ala Ser Leu His | |
| 1925 1930 1935 | |
| gcg gat gag ccc acg tcg gag gtc gat tgg tcg tcg ggg gcg gtc cgg | 5856 |
| Ala Asp Glu Pro Thr Ser Glu Val Asp Trp Ser Ser Gly Ala Val Arg | |
| 1940 1945 1950 | |
| ctc ctc gcc gaa cag gta cct tgg ccg gag tct gac cgt gtt cgt cgg | 5904 |
| Leu Leu Ala Glu Gln Val Pro Trp Pro Glu Ser Asp Arg Val Arg Arg | |
| 1955 1960 1965 | |
| gtg ggg gtt tcg tcg ttc ggg atc agc ggc acc aac gca cat gtg atc | 5952 |
| Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile | |
| 1970 1975 1980 | |
| ctc gaa caa gct acg aat gcg cca gat agt aca gcg gag acg gac aaa | 6000 |
| Leu Glu Gln Ala Thr Asn Ala Pro Asp Ser Thr Ala Glu Thr Asp Lys | |
| 1985 1990 1995 2000 | |
| aca gaa tcc gga tct act gtc gat att ccg gtc gtt ccc tgg ttg gtg | 6048 |
| Thr Glu Ser Gly Ser Thr Val Asp Ile Pro Val Val Pro Trp Leu Val | |
| 2005 2010 2015 | |
| tcg gga aag acg acg gat tcc ctg cgg gga caa gcc gaa cga gtc ttg | 6096 |
| Ser Gly Lys Thr Thr Asp Ser Leu Arg Gly Gln Ala Glu Arg Val Leu | |
| 2020 2025 2030 | |
| tct cag gtc gag tcc cgg ccg gag cag cgt tcg ctg gat gtt gcc tac | 6144 |
| Ser Gln Val Glu Ser Arg Pro Glu Gln Arg Ser Leu Asp Val Ala Tyr | |
| 2035 2040 2045 | |
| tcg ctt gct tct ggc cga gcc gcg ctg gat gaa cgc gct gtc gtg ctg | 6192 |
| Ser Leu Ala Ser Gly Arg Ala Ala Leu Asp Glu Arg Ala Val Val Leu | |
| 2050 2055 2060 | |
| ggt gcg gac cgc ggt gag ctg gtt gct gga ctg gcg gcg ttg gcc gcc | 6240 |
| Gly Ala Asp Arg Gly Glu Leu Val Ala Gly Leu Ala Ala Leu Ala Ala | |
| 2065 2070 2075 2080 | |
| ggt cag gag gct tct ggg gtg atc agc gga act cgt gct tct gct cgg | 6288 |
| Gly Gln Glu Ala Ser Gly Val Ile Ser Gly Thr Arg Ala Ser Ala Arg | |
| 2085 2090 2095 | |
| ttc ggg ttc gtg ttc tcg ggg cag ggt ggt cag tgg ttg ggg atg ggc | 6336 |

| | |
|-----------------------------------------------------------------|----------------|
| Phe Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly Met Gly | |
| 2100 | 2105 2110 |
| aga gcg ctc tac tcg aag ttt ccg gtg ttc gct gct gcg ttt gat gag | 6384 |
| Arg Ala Leu Tyr Ser Lys Phe Pro Val Phe Ala Ala Phe Asp Glu | |
| 2115 | 2120 2125 |
| gct tgc gcc gag ttg gag gca cat ctg ggg gaa gac cgc cgg gtt cgg | 6432 |
| Ala Cys Ala Glu Leu Glu Ala His Leu Gly Glu Asp Arg Arg Val Arg | |
| 2130 | 2135 2140 |
| gat gtg gtc ttc ggt tcc gat gcg cag ctg ctg gat cag acg ctg tgg | 6480 |
| Asp Val Val Phe Gly Ser Asp Ala Gln Leu Leu Asp Gln Thr Leu Trp | |
| 2145 | 2150 2155 2160 |
| gcg cag tcg ggt ctg ttc gcg ctg caa gcc ggc ctc ttg ggg ctg ctg | 6528 |
| Ala Gln Ser Gly Leu Phe Ala Leu Gln Ala Gly Leu Leu Gly Leu Leu | |
| 2165 | 2170 2175 |
| ggt tcg tgg ggc gtt cgg ccg gat gtg gtg atg ggg cat tcg gtc ggg | 6576 |
| Gly Ser Trp Gly Val Arg Pro Asp Val Val Met Gly His Ser Val Gly | |
| 2180 | 2185 2190 |
| gag ttg gcc gcc gcg ttt gcg gct ggc gtg ttg tcg ttg cgg gat gcg | 6624 |
| Glu Leu Ala Ala Phe Ala Ala Gly Val Leu Ser Leu Arg Asp Ala | |
| 2195 | 2200 2205 |
| gct cgg ttg gtg gcc gcg cgc gcc cgg ttg atg caa gcc ctg ccc tct | 6672 |
| Ala Arg Leu Val Ala Ala Arg Ala Arg Leu Met Gln Ala Leu Pro Ser | |
| 2210 | 2215 2220 |
| gac ggc gcg atg ttg gcg gtg gct gct ggt gaa gac ctt gtt cgg cca | 6720 |
| Asp Gly Ala Met Leu Ala Val Ala Ala Gly Glu Asp Leu Val Arg Pro | |
| 2225 | 2230 2235 2240 |
| ttg ctg gcc ggt cgg gag gag tcc gtg agc gtc gcc gcg ctc aat gcc | 6768 |
| Leu Leu Ala Gly Arg Glu Glu Ser Val Ser Val Ala Ala Leu Asn Ala | |
| 2245 | 2250 2255 |
| ccc ggt tcg gtg gtg ttg tcg ggc gat cgg gag gtg ctg gcc agc atc | 6816 |
| Pro Gly Ser Val Val Leu Ser Gly Asp Arg Glu Val Leu Ala Ser Ile | |
| 2260 | 2265 2270 |
| gtc ggc cgg ctg acc gag ctc cga gtc cgg acg cgg cgc ttg cgg gtc | 6864 |
| Val Gly Arg Leu Thr Glu Leu Arg Val Arg Thr Arg Arg Leu Arg Val | |
| 2275 | 2280 2285 |
| tcc cat gct ttt cat tcg cac cgg atg gac ccg atg ttg ggc gag ttc | 6912 |
| Ser His Ala Phe His Ser His Arg Met Asp Pro Met Leu Gly Glu Phe | |
| 2290 | 2295 2300 |
| gcc cag atc gcc gag tct gcg gag ttc ggt aag cca acg aca ccg ctt | 6960 |
| Ala Gln Ile Ala Glu Ser Ala Glu Phe Gly Lys Pro Thr Thr Pro Leu | |
| 2305 | 2310 2315 2320 |
| gtg tcg acg ttg acg ggt gag ctc gac aga gcc gcg gaa atg agc aca | 7008 |
| Val Ser Thr Leu Thr Gly Glu Leu Asp Arg Ala Ala Glu Met Ser Thr | |

| 2325 | 2330 | 2335 | |
|-----------------------------------------------------------------|------|------|------|
| cca ggg tat tgg gtg cgc cag gcg cgt gaa ccc gtc cgt ttc gcc gac | | | 7056 |
| Pro Gly Tyr Trp Val Arg Gln Ala Arg Glu Pro Val Arg Phe Ala Asp | | | |
| 2340 | 2345 | 2350 | |
| ggt gtc cag gcc ctg gca gcg cag ggc ata ggc acg gtc gtc gag ctc | | | 7104 |
| Gly Val Gln Ala Leu Ala Ala Gln Gly Ile Gly Thr Val Val Glu Leu | | | |
| 2355 | 2360 | 2365 | |
| ggc ccg gac gga acg ctg gcg gca ctg gtt cgg gag tgt gcg acc gag | | | 7152 |
| Gly Pro Asp Gly Thr Leu Ala Ala Leu Val Arg Glu Cys Ala Thr Glu | | | |
| 2370 | 2375 | 2380 | |
| tcc gat cgg gtt ggg cgg att tcg tcg atc cca ctg atg cgc agg gag | | | 7200 |
| Ser Asp Arg Val Gly Arg Ile Ser Ser Ile Pro Leu Met Arg Arg Glu | | | |
| 2385 | 2390 | 2395 | 2400 |
| cgg gac gag acc cgt tcg gtg atg aca gcc ctg gcg cat ctc cac acc | | | 7248 |
| Arg Asp Glu Thr Arg Ser Val Met Thr Ala Leu Ala His Leu His Thr | | | |
| 2405 | 2410 | 2415 | |
| cgt ggt ggt gag gtg gac tgg cag gcg ttt ttc gcc ggt acc ggc gct | | | 7296 |
| Arg Gly Gly Glu Val Asp Trp Gln Ala Phe Phe Ala Gly Thr Gly Ala | | | |
| 2420 | 2425 | 2430 | |
| agg cag ctc gag ttg cca acg tat gcc ttc caa cga cag cac tac tgg | | | 7344 |
| Arg Gln Leu Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln His Tyr Trp | | | |
| 2435 | 2440 | 2445 | |
| atc gag tcc agt gcg cgg cca gca cgc gac cgc gca gac atc ggc gag | | | 7392 |
| Ile Glu Ser Ser Ala Arg Pro Ala Arg Asp Arg Ala Asp Ile Gly Glu | | | |
| 2450 | 2455 | 2460 | |
| gtg gcg gaa cag ttc tgg acc gcg gtt gac caa ggc gat ctg gca acg | | | 7440 |
| Val Ala Glu Gln Phe Trp Thr Ala Val Asp Gln Gly Asp Leu Ala Thr | | | |
| 2465 | 2470 | 2475 | 2480 |
| ttg gtc gcc gct ctg gat ctt ggg gcg gac gac gac aca tgc gca tcg | | | 7488 |
| Leu Val Ala Ala Leu Asp Leu Gly Ala Asp Asp Asp Thr Cys Ala Ser | | | |
| 2485 | 2490 | 2495 | |
| ttg agc gat gta ttg ccg gcg ttg tcc tcc tgg cga agc gga ctc cgc | | | 7536 |
| Leu Ser Asp Val Leu Pro Ala Leu Ser Ser Trp Arg Ser Gly Leu Arg | | | |
| 2500 | 2505 | 2510 | |
| aac cgt tcg ctc gtc gat tcc tgc cgg tac cga atc agt tgg cat tcc | | | 7584 |
| Asn Arg Ser Leu Val Asp Ser Cys Arg Tyr Arg Ile Ser Trp His Ser | | | |
| 2515 | 2520 | 2525 | |
| tct cgg gag gtg ccg gcc ccg aag att tcc ggt acc tgg ctg ttg gtc | | | 7632 |
| Ser Arg Glu Val Pro Ala Pro Lys Ile Ser Gly Thr Trp Leu Leu Val | | | |
| 2530 | 2535 | 2540 | |
| gtg ccc ggt gct gcg gat gac gga ttg gtc acg gct ttg acg agt tca | | | 7680 |
| Val Pro Gly Ala Ala Asp Asp Gly Leu Val Thr Ala Leu Thr Ser Ser | | | |
| 2545 | 2550 | 2555 | 2560 |

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|-----------------------------------------------------------------|------|
| ctg gtc gga ggc ggc gcc gag gtc gtc cgg atc ggc ctg tcc gaa gag | 7728 |
| Leu Val Gly Gly Gly Ala Glu Val Val Arg Ile Gly Leu Ser Glu Glu | |
| 2565 2570 2575 | |
| gac ccg cac cgc gag gac gtc gca cag cgg ctg gcc aat gcg ctg acg | 7776 |
| Asp Pro His Arg Glu Asp Val Ala Gln Arg Leu Ala Asn Ala Leu Thr | |
| 2580 2585 2590 | |
| gat gcc ggt caa ctc ggt ggc gtg ctt tcg ctg ttg ggg ctc gat gaa | 7824 |
| Asp Ala Gly Gln Leu Gly Gly Val Leu Ser Leu Leu Gly Leu Asp Glu | |
| 2595 2600 2605 | |
| tcg cct gct ccg gga ttc tcc tgc ttg cca act ggt ttc gcg ctg act | 7872 |
| Ser Pro Ala Pro Gly Phe Ser Cys Leu Pro Thr Gly Phe Ala Leu Thr | |
| 2610 2615 2620 | |
| gtg cag ctt ctg cgg gcc ttg cgg aag gcc gac gtc gag gcg cct ttt | 7920 |
| Val Gln Leu Leu Arg Ala Leu Arg Lys Ala Asp Val Glu Ala Pro Phe | |
| 2625 2630 2635 2640 | |
| tgg gcg gtg acg cgc ggc ggc gtc gcg ttg gaa gat gta cgc gtg tct | 7968 |
| Trp Ala Val Thr Arg Gly Gly Val Ala Leu Glu Asp Val Arg Val Ser | |
| 2645 2650 2655 | |
| ccg gag cag gcc ctg gtc tgg ggg ctg ctg cgt gtc gcg gga ctg gag | 8016 |
| Pro Glu Gln Ala Leu Val Trp Gly Leu Leu Arg Val Ala Gly Leu Glu | |
| 2660 2665 2670 | |
| cac ccg gag ttc tgg ggt ggc ttg atc gac ctg cca tcg gac tgg gac | 8064 |
| His Pro Glu Phe Trp Gly Gly Leu Ile Asp Leu Pro Ser Asp Trp Asp | |
| 2675 2680 2685 | |
| gac cga ttg ggt gcc cgg ttg gcg ggt gtg ttg gcg gat ggt ggc gag | 8112 |
| Asp Arg Leu Gly Ala Arg Leu Ala Gly Val Leu Ala Asp Gly Gly Glu | |
| 2690 2695 2700 | |
| gat caa gtc gcc att cgc cgt ggt ggt gtg ttc gtg cgg cgg ttg gaa | 8160 |
| Asp Gln Val Ala Ile Arg Arg Gly Gly Val Phe Val Arg Arg Leu Glu | |
| 2705 2710 2715 2720 | |
| cgc gct ggt gcg tcg ggt gcc ggg tcg gtg tgg cgt cct cgg ggg acg | 8208 |
| Arg Ala Gly Ala Ser Gly Ala Gly Ser Val Trp Arg Pro Arg Gly Thr | |
| 2725 2730 2735 | |
| gtg ttg gtg acg ggt ggt acg ggc ggt ttg ggg gcg cat gtt gcc cgg | 8256 |
| Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala Arg | |
| 2740 2745 2750 | |
| tgg ttg gcc ggt gcc ggg gct gag cac gtg gtg ttg acc agc cgt cga | 8304 |
| Trp Leu Ala Gly Ala Gly Ala Glu His Val Val Leu Thr Ser Arg Arg | |
| 2755 2760 2765 | |
| gga gcg gac gct ccg ggc gct ggg gaa ttg cgg gcg gag ctg gag gcg | 8352 |
| Gly Ala Asp Ala Pro Gly Ala Gly Glu Leu Arg Ala Glu Leu Glu Ala | |
| 2770 2775 2780 | |

| | | | | | | | | | | | | | | | | |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|-----|------|
| ctg | ggg | gct | cgg | gtg | tcg | att | gtg | ccc | tgc | gac | gtg | gct | gat | cgt | gac | 8400 |
| Leu | Gly | Ala | Arg | Val | Ser | Ile | Val | Pro | Cys | Asp | Val | Ala | Asp | Arg | Asp | |
| 2785 | | | 2790 | | | 2795 | | | 2800 | | | | | | | |
| gca | gtg | gct | gga | gtg | ttg | gca | ggg | atc | ggt | ggg | gag | tgt | ccg | ctg | act | 8448 |
| Ala | Val | Ala | Gly | Val | Leu | Ala | Gly | Ile | Gly | Gly | Glu | Cys | Pro | Leu | Thr | |
| 2805 | | | 2810 | | | 2815 | | | | | | | | | | |
| gcg | gtg | gta | cac | gcc | gcc | ggg | gtc | ggc | gag | gcg | ggc | gac | gta | gtg | gag | 8496 |
| Ala | Val | Val | His | Ala | Ala | Gly | Val | Gly | Glu | Ala | Gly | Asp | Val | Val | Glu | |
| 2820 | | | 2825 | | | 2830 | | | | | | | | | | |
| atg | ggg | ttg | gcg | gat | ttt | gca | gcg | gtg | ttg | tcg | gcg | aag | gtg | cgt | ggt | 8544 |
| Met | Gly | Leu | Ala | Asp | Phe | Ala | Ala | Val | Leu | Ser | Ala | Lys | Val | Arg | Gly | |
| 2835 | | | 2840 | | | 2845 | | | | | | | | | | |
| gcg | gcg | aat | ctg | gac | gag | ttg | ctg | gcc | gac | tcg | gag | ctg | gat | gcg | ttt | 8592 |
| Ala | Ala | Asn | Leu | Asp | Glu | Leu | Leu | Ala | Asp | Ser | Glu | Leu | Asp | Ala | Phe | |
| 2850 | | | 2855 | | | 2860 | | | | | | | | | | |
| gtg | atg | ttc | tcc | tcg | gtg | tcg | ggg | gtg | tgg | gga | gcc | ggc | gga | cag | ggt | 8640 |
| Val | Met | Phe | Ser | Ser | Val | Ser | Gly | Val | Trp | Gly | Ala | Gly | Gly | Gln | Gly | |
| 2865 | | | 2870 | | | 2875 | | | 2880 | | | | | | | |
| gcg | tat | gcg | gct | gcg | aac | gcc | tac | ttg | gat | gcg | ttg | gcc | gag | cag | cgt | 8688 |
| Ala | Tyr | Ala | Ala | Ala | Asn | Ala | Tyr | Leu | Asp | Ala | Leu | Ala | Glu | Gln | Arg | |
| 2885 | | | 2890 | | | 2895 | | | | | | | | | | |
| cgg | gcg | agg | gga | ttg | gtc | ggg | acc | gcg | gtt | gcg | tgg | gga | ccg | tgg | gcc | 8736 |
| Arg | Ala | Arg | Gly | Leu | Val | Gly | Thr | Ala | Val | Ala | Trp | Gly | Pro | Trp | Ala | |
| 2900 | | | 2905 | | | 2910 | | | | | | | | | | |
| ggt | gac | ggc | atg | gcc | gcc | ggc | gaa | acc | ggc | gca | cag | ctg | cac | cgg | atg | 8784 |
| Gly | Asp | Gly | Met | Ala | Ala | Gly | Glu | Thr | Gly | Ala | Gln | Leu | His | Arg | Met | |
| 2915 | | | 2920 | | | 2925 | | | | | | | | | | |
| ggc | ctg | gcg | tcg | atg | gaa | ccg | agc | gcg | gcg | ctg | ctg | gca | ctt | cag | ggt | 8832 |
| Gly | Leu | Ala | Ser | Met | Glu | Pro | Ser | Ala | Ala | Leu | Leu | Ala | Leu | Gln | Gly | |
| 2930 | | | 2935 | | | 2940 | | | | | | | | | | |
| gca | ttg | gac | cgc | gat | gag | acc | tcc | ctc | gtc | gtg | gcc | gat | gtc | gat | tgg | 8880 |
| Ala | Leu | Asp | Arg | Asp | Glu | Thr | Ser | Leu | Val | Val | Ala | Asp | Val | Asp | Trp | |
| 2945 | | | 2950 | | | 2955 | | | 2960 | | | | | | | |
| gca | cgg | ttc | gcc | cca | gcc | ttc | acc | tcg | gca | cgt | cga | cgc | ccg | ctg | ctg | 8928 |
| Ala | Arg | Phe | Ala | Pro | Ala | Phe | Thr | Ser | Ala | Arg | Arg | Arg | Pro | Leu | Leu | |
| 2965 | | | 2970 | | | 2975 | | | | | | | | | | |
| gac | acc | atc | gac | gag | gcc | cga | gcc | gca | ttg | gaa | acc | acc | ggc | gaa | caa | 8976 |
| Asp | Thr | Ile | Asp | Glu | Ala | Arg | Ala | Ala | Leu | Glu | Thr | Thr | Gly | Glu | Gln | |
| 2980 | | | 2985 | | | 2990 | | | | | | | | | | |
| gcg | ggc | aca | ggc | aaa | ccc | gtt | gag | ctg | acg | caa | cgc | ctg | gcc | gga | ctg | 9024 |
| Ala | Gly | Thr | Gly | Lys | Pro | Val | Glu | Leu | Thr | Gln | Arg | Leu | Ala | Gly | Leu | |
| 2995 | | | 3000 | | | 3005 | | | | | | | | | | |
| tcg | cgg | aag | gaa | cgc | gac | gat | gcg | gta | ttg | gat | ctg | gtg | cgg | gcg | qag | 9072 |

Ser Arg Lys Glu Arg Asp Asp Ala Val Leu Asp Leu Val Arg Ala Glu
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 acg gcg gct gtg ctg gga cgc gac gat gcc acg gcc ctg gcg cca tcg 9120
 Thr Ala Ala Val Leu Gly Arg Asp Asp Ala Thr Ala Leu Ala Pro Ser
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 Arg Pro Phe Gln Glu Leu Gly Phe Asp Ser Leu Met Ala Val Glu Leu
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 Arg Asn Arg Leu Asn Thr Ala Thr Gly Ile Gln Leu Pro Ala Ser Thr
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 Ile Phe Asp Tyr Pro Asn Ala Glu Ser Leu Ser Arg His Leu Cys Ala
 3075 3080 3085
 gag ctt ttc cca acg gag act acc gtg gac tcg gcc ctt gcc gag ctc 9312
 Glu Leu Phe Pro Thr Glu Thr Thr Val Asp Ser Ala Leu Ala Glu Leu
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 gat cga atc gag cag cag ctc tcg atg ctc acc ggc gaa gcg cgg gca 9360
 Asp Arg Ile Glu Gln Gln Leu Ser Met Leu Thr Gly Glu Ala Arg Ala
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 3125 3130 3135
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 Ser Ala Ala Glu Val Pro Thr Gly Ala Asp Val Leu Ser Thr Leu Asp
 3140 3145 3150
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 3170

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 Asp Leu His Gln Ala Arg Glu Arg Leu His Glu Ala Glu Ser Gly Glu
 20 25 30
 Arg Glu Pro Ile Ala Ile Val Ala Met Gly Cys Arg Tyr Pro Gly Gly

| 35 | | | | | 40 | | | | | 45 | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Val | Gln | Asp | Pro | Glu | Gly | Leu | Trp | Lys | Leu | Val | Ala | Ser | Gly | Gly | Asp | |
| 50 | | | | | 55 | | | | | 60 | | | | | | |
| Ala | Ile | Gly | Glu | Phe | Pro | Ala | Asp | Arg | Gly | Trp | His | Leu | Asp | Glu | Leu | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | |
| Tyr | Asp | Pro | Asp | Pro | Asp | Gln | Pro | Gly | Thr | Cys | Tyr | Thr | Arg | His | Gly | |
| 85 | | | | | 90 | | | | | 95 | | | | | | |
| Gly | Phe | Leu | His | Asp | Ala | Gly | Glu | Phe | Asp | Ala | Gly | Phe | Phe | Asp | Ile | |
| 100 | | | | | 105 | | | | | 110 | | | | | | |
| Ser | Pro | Arg | Glu | Ala | Leu | Ala | Met | Asp | Pro | Gln | Gln | Arg | Leu | Leu | Leu | |
| 115 | | | | | 120 | | | | | 125 | | | | | | |
| Glu | Ile | Ser | Trp | Glu | Thr | Val | Glu | Ser | Ala | Gly | Met | Asp | Pro | Arg | Ser | |
| 130 | | | | | 135 | | | | | 140 | | | | | | |
| Leu | Arg | Gly | Ser | Arg | Thr | Gly | Val | Phe | Ala | Gly | Leu | Met | Tyr | Glu | Gly | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | |
| Tyr | Asp | Thr | Gly | Ala | His | Arg | Ala | Gly | Glu | Gly | Val | Glu | Gly | Tyr | Leu | |
| 165 | | | | | 170 | | | | | 175 | | | | | | |
| Gly | Thr | Gly | Asn | Ala | Gly | Ser | Val | Ala | Ser | Gly | Arg | Val | Ala | Tyr | Ala | |
| 180 | | | | | 185 | | | | | 190 | | | | | | |
| Phe | Gly | Phe | Glu | Gly | Pro | Ala | Val | Thr | Val | Asp | Thr | Ala | Cys | Ser | Ser | |
| 195 | | | | | 200 | | | | | 205 | | | | | | |
| Ser | Leu | Val | Ala | Leu | His | Leu | Ala | Cys | Gln | Ser | Leu | Arg | Gln | Gly | Glu | |
| 210 | | | | | 215 | | | | | 220 | | | | | | |
| Cys | Asp | Leu | Ala | Leu | Ala | Gly | Gly | Val | Thr | Val | Met | Ser | Thr | Pro | Glu | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | |
| Arg | Phe | Val | Glu | Phe | Ser | Arg | Gln | Arg | Gly | Leu | Ala | Pro | Asp | Gly | Arg | |
| 245 | | | | | 250 | | | | | 255 | | | | | | |
| Cys | Lys | Ser | Phe | Ala | Ala | Ala | Ala | Asp | Gly | Thr | Gly | Trp | Gly | Glu | Gly | |
| 260 | | | | | 265 | | | | | 270 | | | | | | |
| Ala | Gly | Leu | Val | Leu | Leu | Glu | Arg | Leu | Ser | Asp | Ala | Arg | Arg | Asn | Gly | |
| 275 | | | | | 280 | | | | | 285 | | | | | | |
| His | Arg | Val | Leu | Ala | Val | Val | Arg | Gly | Ser | Ala | Val | Asn | Gln | Asp | Gly | |
| 290 | | | | | 295 | | | | | 300 | | | | | | |
| Ala | Ser | Asn | Gly | Leu | Thr | Ala | Pro | Asn | Gly | Leu | Ala | Gln | Glu | Arg | Val | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| Ile | Gln | Gln | Val | Leu | Thr | Ser | Ala | Gly | Leu | Ser | Ala | Ser | Asp | Val | Asp | |
| 325 | | | | | 330 | | | | | 335 | | | | | | |
| Ala | Val | Glu | Ala | His | Gly | Thr | Gly | Thr | Arg | Leu | Gly | Asp | Pro | Ile | Glu | |

| 340 | | | | | 345 | | | | | 350 | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Gln | Ala | Leu | Ile | Ala | Ala | Tyr | Gly | Gln | Asp | Arg | Asp | Arg | Asp | Arg |
| 355 | | | | | | 360 | | | | | | 365 | | | |
| Pro | Leu | Trp | Leu | Gly | Ser | Val | Lys | Ser | Asn | Ile | Gly | His | Thr | Gln | Ala |
| 370 | | | | | | 375 | | | | | | 380 | | | |
| Ala | Ala | Gly | Val | Ala | Gly | Val | Ile | Lys | Met | Val | Met | Ala | Met | Arg | His |
| 385 | | | | | | 390 | | | | | | 395 | | | |
| Gly | Glu | Leu | Pro | Arg | Thr | Leu | His | Val | Asp | Glu | Pro | Asn | Ser | His | Val |
| | | | 405 | | | | | | 410 | | | 415 | | | |
| Asp | Trp | Ser | Ala | Gly | Ala | Val | Arg | Leu | Leu | Thr | Glu | Asn | Ile | Arg | Trp |
| | | | 420 | | | | | | 425 | | | 430 | | | |
| Pro | Gly | Thr | Gly | Thr | Arg | Arg | Ala | Gly | Val | Ser | Ser | Phe | Gly | Val | Ser |
| | | | 435 | | | | | | 440 | | | 445 | | | |
| Gly | Thr | Asn | Ala | His | Val | Ile | Leu | Glu | His | Asp | Pro | Leu | Ala | Val | Thr |
| 450 | | | | | | 455 | | | | | | 460 | | | |
| Glu | Asn | Glu | Glu | Ala | Ala | Gln | Ser | Pro | Ala | Pro | Gly | Ile | Val | Pro | Trp |
| 465 | | | | | | 470 | | | | | | 475 | | | |
| Ala | Leu | Ser | Gly | Arg | Ser | Ser | Thr | Ala | Leu | Arg | Ala | Gln | Ala | Glu | Arg |
| | | | 485 | | | | | | 490 | | | 495 | | | |
| Leu | Arg | Glu | Leu | Cys | Glu | Gln | Thr | Asp | Pro | Asp | Pro | Val | Asp | Val | Gly |
| | | | 500 | | | | | | 505 | | | 510 | | | |
| Phe | Ser | Leu | Ala | Ala | Thr | Arg | Thr | Ala | Trp | Glu | His | Arg | Ala | Val | Val |
| 515 | | | | | | 520 | | | | | | 525 | | | |
| Leu | Gly | Arg | Asp | Ser | Ala | Thr | Leu | Arg | Ser | Gly | Leu | Gly | Val | Val | Ala |
| 530 | | | | | | 535 | | | | | | 540 | | | |
| Ser | Gly | Glu | Pro | Ala | Val | Asp | Val | Val | Glu | Gly | Ser | Val | Leu | Asp | Gly |
| 545 | | | | | | 550 | | | | | | 555 | | | |
| Glu | Val | Val | Phe | Val | Phe | Pro | Gly | Gln | Gly | Trp | Gln | Trp | Ala | Gly | Met |
| | | | 565 | | | | | | 570 | | | 575 | | | |
| Ala | Val | Asp | Leu | Leu | Asp | Ala | Ser | Pro | Thr | Phe | Ala | Arg | His | Met | Asp |
| | | | 580 | | | | | | 585 | | | 590 | | | |
| Glu | Cys | Ala | Thr | Ala | Leu | Arg | Arg | Tyr | Val | Asp | Trp | Ser | Leu | Val | Asp |
| 595 | | | | | | 600 | | | | | | 605 | | | |
| Val | Leu | Arg | Gly | Ala | Glu | Asn | Ser | Pro | Pro | Leu | Asp | Arg | Val | Asp | Val |
| 610 | | | | | | 615 | | | | | | 620 | | | |
| Leu | Gln | Pro | Ala | Ser | Phe | Ala | Val | Met | Val | Ser | Leu | Ala | Glu | Val | Trp |
| 625 | | | | | | 630 | | | | | | 635 | | | |
| Arg | Ser | Tyr | Gly | Val | Arg | Pro | Ala | Ala | Val | Val | Gly | His | Ser | Gln | Gly |

| 645 | | | | | | | | | | 650 | | | | | 655 | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Glu | Ile | Ala | Ala | Ala | Cys | Ala | Ala | Gly | Val | Leu | Pro | Leu | Glu | Asp | Ala | | | | |
| | | | 660 | | | | | 665 | | | | | 670 | | | | | | |
| Ala | Arg | Leu | Val | Ala | Leu | Arg | Ser | Arg | Ala | Leu | Lys | Gly | Leu | Ser | Gly | | | | |
| | | 675 | | | | | 680 | | | | | 685 | | | | | | | |
| Arg | Gly | Gly | Met | Ala | Ser | Leu | Ala | Cys | Pro | Ala | Asp | Glu | Val | Ala | Ala | | | | |
| | | 690 | | | | 695 | | | | | 700 | | | | | | | | |
| Leu | Phe | Ala | Gly | Ser | Gly | Gly | Arg | Leu | Glu | Val | Ala | Ala | Ile | Asn | Gly | | | | |
| 705 | | | | | 710 | | | | 715 | | | | | | 720 | | | | |
| Pro | Arg | Ser | Val | Val | Val | Ser | Gly | Asp | Leu | Glu | Ala | Val | Asp | Glu | Leu | | | | |
| | | | 725 | | | | | 730 | | | | | 735 | | | | | | |
| Leu | Ala | Glu | Cys | Ala | Glu | Lys | Asp | Met | Arg | Ala | Arg | Arg | Ile | Pro | Val | | | | |
| | | 740 | | | | | 745 | | | | | | 750 | | | | | | |
| Asp | Tyr | Ala | Ser | His | Ser | Ala | His | Val | Glu | Val | Val | Arg | Ser | Pro | Val | | | | |
| | 755 | | | | | | 760 | | | | | 765 | | | | | | | |
| Leu | Ala | Ala | Ala | Ala | Gly | Val | Arg | His | Arg | Asp | Gly | Gln | Val | Pro | Trp | | | | |
| 770 | | | | | 775 | | | | | | 780 | | | | | | | | |
| Trp | Ser | Thr | Val | Ile | Gly | Asp | Trp | Val | Asp | Pro | Ala | Arg | Leu | Asp | Gly | | | | |
| 785 | | | | | 790 | | | | 795 | | | | | 800 | | | | | |
| Glu | Tyr | Trp | Tyr | Arg | Asn | Leu | Arg | Gln | Pro | Val | Arg | Phe | Glu | His | Ala | | | | |
| | | | 805 | | | | | 810 | | | | | 815 | | | | | | |
| Val | Gln | Gly | Leu | Val | Glu | Arg | Gly | Phe | Gly | Leu | Phe | Ile | Glu | Met | Ser | | | | |
| | | 820 | | | | | 825 | | | | | 830 | | | | | | | |
| Ala | His | Pro | Val | Leu | Thr | Thr | Ala | Val | Glu | Glu | Thr | Gly | Ala | Glu | Ser | | | | |
| | 835 | | | | | | 840 | | | | | 845 | | | | | | | |
| Glu | Thr | Ala | Val | Ala | Ala | Val | Gly | Thr | Leu | Arg | Arg | Asp | Ser | Gly | Gly | | | | |
| 850 | | | | | 855 | | | | | | 860 | | | | | | | | |
| Leu | Arg | Arg | Leu | Leu | His | Ser | Leu | Ala | Glu | Ala | Tyr | Val | Arg | Gly | Ala | | | | |
| 865 | | | | | 870 | | | | 875 | | | | | 880 | | | | | |
| Thr | Val | Asp | Trp | Ala | Val | Ala | Phe | Gly | Gly | Ala | Gly | Arg | Arg | Leu | Asp | | | | |
| | | 885 | | | | | | 890 | | | | 895 | | | | | | | |
| Leu | Pro | Thr | Tyr | Pro | Phe | Gln | Arg | Gln | Arg | Tyr | Trp | Leu | Asp | Lys | Gly | | | | |
| | | 900 | | | | | 905 | | | | | 910 | | | | | | | |
| Ala | Ala | Ser | Asp | Glu | Ala | Arg | Ala | Val | Ser | Asp | Pro | Ala | Ala | Gly | Trp | | | | |
| | 915 | | | | | | 920 | | | | 925 | | | | | | | | |
| Phe | Trp | Gln | Ala | Val | Ala | Arg | Gln | Asp | Leu | Lys | Ser | Val | Ser | Asp | Ala | | | | |
| 930 | | | | | 935 | | | | 940 | | | | | | | | | | |
| Leu | Asp | Leu | Asp | Ala | Asp | Ala | Pro | Leu | Ser | Ala | Thr | Leu | Pro | Ala | Leu | | | | |

| | | | | | | |
|-----------------------------------------------------------------|------|-----|------|-----|------|------|
| 945 | | 950 | | 955 | | 960 |
| Ser Val Trp His Arg Gln Glu Arg Glu Arg Val Leu Ala Asp Gly Trp | | | | | | |
| | 965 | | | 970 | | 975 |
| Arg Tyr Arg Val Asp Trp Val Arg Val Ala Pro Gln Pro Val Arg Arg | | | | | | |
| | 980 | | | 985 | | 990 |
| Thr Arg Glu Thr Trp Leu Leu Val Val Pro Pro Gly Gly Ile Glu Glu | | | | | | |
| | 995 | | 1000 | | 1005 | |
| Ala Leu Val Glu Arg Leu Thr Asp Ala Leu Asn Thr Arg Gly Ile Ser | | | | | | |
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| Thr Leu Arg Leu Asp Val Pro Pro Ala Ala Thr Ser Gly Glu Leu Ala | | | | | | |
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| Thr Glu Leu Arg Ala Ala Ala Asp Gly Asp Pro Val Lys Ala Ile Leu | | | | | | |
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| Ser Leu Thr Ala Leu Asp Glu Arg Pro His Pro Glu Cys Lys Asp Val | | | | | | |
| | 1060 | | 1065 | | 1070 | |
| Pro Ser Gly Ile Ala Leu Leu Leu Asn Leu Val Lys Ala Leu Gly Glu | | | | | | |
| | 1075 | | 1080 | | 1085 | |
| Ala Asp Leu Arg Ile Pro Leu Trp Thr Ile Thr Arg Gly Ala Val Lys | | | | | | |
| | 1090 | | 1095 | | 1100 | |
| Ala Gly Pro Ala Asp Arg Leu Leu Arg Pro Met Gln Ala Gln Ala Trp | | | | | | |
| | 1105 | | 1110 | | 1115 | 1120 |
| Gly Leu Gly Arg Val Ala Ala Leu Glu His Pro Glu Arg Trp Gly Gly | | | | | | |
| | 1125 | | 1130 | | 1135 | |
| Leu Ile Asp Leu Pro Asp Ser Leu Asp Gly Asp Val Leu Thr Arg Leu | | | | | | |
| | 1140 | | 1145 | | 1150 | |
| Gly Glu Ala Leu Thr Asn Gly Leu Ala Glu Asp Gln Leu Ala Ile Arg | | | | | | |
| | 1155 | | 1160 | | 1165 | |
| Gln Ser Gly Val Leu Ala Arg Arg Leu Val Pro Ala Pro Ala Asn Gln | | | | | | |
| | 1170 | | 1175 | | 1180 | |
| Pro Ala Gly Arg Lys Trp Arg Pro Arg Gly Ser Ala Leu Ile Thr Gly | | | | | | |
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| Gly Leu Gly Ala Val Gly Ala Gln Val Ala Arg Trp Leu Ala Glu Ile | | | | | | |
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| Gly Ala Glu Arg Ile Val Leu Thr Ser Arg Arg Gly Asn Gln Ala Ala | | | | | | |
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| Gly Ala Ala Glu Leu Glu Ala Glu Leu Arg Ala Leu Gly Ala Gln Val | | | | | | |
| | 1235 | | 1240 | | 1245 | |
| Ser Ile Val Ala Cys Asp Val Thr Asp Arg Ala Glu Met Ser Ala Leu | | | | | | |

| 1250 | 1255 | 1260 |
|-----------------------------------------------------------------|------|----------------|
| Leu Ala Glu Phe Asp Val Thr Ala Val Phe His Ala Ala Gly Val Gly | | |
| 1265 | 1270 | 1275 1280 |
| Arg Leu Leu Pro Leu Ala Glu Thr Asp Gln Asn Gly Leu Ala Glu Ile | | |
| | 1285 | 1290 1295 |
| Cys Ala Ala Lys Val Arg Gly Ala Gln Val Leu Asp Glu Leu Cys Asp | | |
| | 1300 | 1305 1310 |
| Ser Thr Asp Leu Asp Ala Phe Val Leu Phe Ser Ser Gly Ala Gly Val | | |
| | 1315 | 1320 1325 |
| Trp Gly Gly Gly Gly Gln Gly Ala Tyr Gly Ala Ala Asn Ala Phe Leu | | |
| | 1330 | 1335 1340 |
| Asp Thr Leu Ala Glu Gln Arg Arg Ala Arg Gly Leu Pro Ala Thr Ser | | |
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| Ile Ser Trp Gly Ser Trp Ala Gly Gly Gly Met Ala Asp Gly Ala Ala | | |
| | 1365 | 1370 1375 |
| Gly Glu His Leu Arg Arg Arg Gly Ile Arg Pro Met Pro Ala Ala Ser | | |
| | 1380 | 1385 1390 |
| Ala Ile Leu Ala Leu Gln Glu Val Leu Asp Gln Asp Glu Thr Cys Val | | |
| | 1395 | 1400 1405 |
| Ser Ile Ala Asp Val Asp Trp Asp Arg Phe Val Pro Thr Phe Ala Ala | | |
| | 1410 | 1415 1420 |
| Thr Arg Ala Thr Arg Leu Phe Asp Glu Val Pro Ala Ala Arg Lys Ala | | |
| | 1425 | 1430 1435 1440 |
| Met Pro Ala Asn Gly Pro Ala Glu Pro Gly Gly Ser Pro Phe Ala Arg | | |
| | 1445 | 1450 1455 |
| Asn Leu Ala Glu Leu Pro Glu Ala Gln Arg Arg His Glu Leu Val Asp | | |
| | 1460 | 1465 1470 |
| Leu Val Cys Ala Gln Val Ala Thr Val Leu Gly His Gly Ser Arg Glu | | |
| | 1475 | 1480 1485 |
| Glu Val Gln Pro Glu Arg Ala Phe Arg Ala Leu Gly Phe Asp Ser Leu | | |
| | 1490 | 1495 1500 |
| Met Ala Val Asp Leu Arg Asn Arg Leu Thr Thr Ala Thr Gly Leu Arg | | |
| | 1505 | 1510 1515 1520 |
| Leu Pro Thr Thr Thr Val Phe Asp Tyr Pro Asn Pro Ala Ala Leu Ala | | |
| | 1525 | 1530 1535 |
| Ala His Leu Leu Glu Glu Leu Val Gly Asp Val Ala Ser Ala Val | | |
| | 1540 | 1545 1550 |
| Thr Ala Ala Ser Ala Pro Ala Ser Asp Glu Pro Ile Ala Ile Val Ala | | |

| 1555 | 1560 | 1565 |
|----------------------------------------------------------------------------------------|------|------|
| Met Ser Cys Arg Phe Pro Gly Gly Ala His Ser Pro Glu Asp Leu Trp 1570 1575 1580 | | |
| Arg Leu Val Ala Ala Gly Thr Glu Val Ile Gly Glu Phe Pro Ser Asp 1585 1590 1595 1600 | | |
| Arg Gly Trp Asp Ala Glu Gly Leu Tyr Asp Pro Asp Ala Ser Arg Pro 1605 1610 1615 | | |
| Gly Thr Thr Tyr Ala Arg Met Ala Gly Phe Leu Tyr Asp Ala Gly Glu 1620 1625 1630 | | |
| Phe Asp Ala Asp Leu Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met 1635 1640 1645 | | |
| Asp Pro Gln Gln Arg Leu Val Leu Glu Ile Ala Trp Glu Ala Leu Glu 1650 1655 1660 | | |
| Arg Ala Gly Ile Asp Pro Leu Ser Leu Lys Gly Ser Gly Val Gly Thr 1665 1670 1675 1680 | | |
| Tyr Ile Gly Ala Gly Ser Arg Gly Tyr Ala Thr Asp Val Arg Gln Phe 1685 1690 1695 | | |
| Pro Glu Glu Ala Glu Gly Tyr Leu Leu Thr Gly Thr Ser Ala Ser Val 1700 1705 1710 | | |
| Leu Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val 1715 1720 1725 | | |
| Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala 1730 1735 1740 | | |
| Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly 1745 1750 1755 1760 | | |
| Val Thr Val Met Ser Thr Pro Glu Met Phe Val Glu Phe Ser Arg Gln 1765 1770 1775 | | |
| Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala 1780 1785 1790 | | |
| Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg 1795 1800 1805 | | |
| Leu Ser Asp Ala His Arg Asn Gly His Arg Val Leu Ala Val Val Arg 1810 1815 1820 | | |
| Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ala Ala Pro 1825 1830 1835 1840 | | |
| Asn Gly Pro Ser Gln Gln Arg Val Ile Asn Gln Ala Leu Ala Asn Ala 1845 1850 1855 | | |
| Ala Leu Ser Ala Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly | | |

| | | |
|-----------------------------------------------------------------|------|------|
| 1860 | 1865 | 1870 |
| Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr | | |
| 1875 | 1880 | 1885 |
| Gly Gln Ala Arg Glu Arg Asp Arg Pro Leu Trp Leu Gly Ser Val Lys | | |
| 1890 | 1895 | 1900 |
| Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile | | |
| 1905 | 1910 | 1915 |
| Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro Ala Ser Leu His | | |
| 1925 | 1930 | 1935 |
| Ala Asp Glu Pro Thr Ser Glu Val Asp Trp Ser Ser Gly Ala Val Arg | | |
| 1940 | 1945 | 1950 |
| Leu Leu Ala Glu Gln Val Pro Trp Pro Glu Ser Asp Arg Val Arg Arg | | |
| 1955 | 1960 | 1965 |
| Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile | | |
| 1970 | 1975 | 1980 |
| Leu Glu Gln Ala Thr Asn Ala Pro Asp Ser Thr Ala Glu Thr Asp Lys | | |
| 1985 | 1990 | 1995 |
| Thr Glu Ser Gly Ser Thr Val Asp Ile Pro Val Val Pro Trp Leu Val | | |
| 2005 | 2010 | 2015 |
| Ser Gly Lys Thr Thr Asp Ser Leu Arg Gly Gln Ala Glu Arg Val Leu | | |
| 2020 | 2025 | 2030 |
| Ser Gln Val Glu Ser Arg Pro Glu Gln Arg Ser Leu Asp Val Ala Tyr | | |
| 2035 | 2040 | 2045 |
| Ser Leu Ala Ser Gly Arg Ala Ala Leu Asp Glu Arg Ala Val Val Leu | | |
| 2050 | 2055 | 2060 |
| Gly Ala Asp Arg Gly Glu Leu Val Ala Gly Leu Ala Ala Leu Ala Ala | | |
| 2065 | 2070 | 2075 |
| Gly Gln Glu Ala Ser Gly Val Ile Ser Gly Thr Arg Ala Ser Ala Arg | | |
| 2085 | 2090 | 2095 |
| Phe Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly Met Gly | | |
| 2100 | 2105 | 2110 |
| Arg Ala Leu Tyr Ser Lys Phe Pro Val Phe Ala Ala Ala Phe Asp Glu | | |
| 2115 | 2120 | 2125 |
| Ala Cys Ala Glu Leu Glu Ala His Leu Gly Glu Asp Arg Arg Val Arg | | |
| 2130 | 2135 | 2140 |
| Asp Val Val Phe Gly Ser Asp Ala Gln Leu Leu Asp Gln Thr Leu Trp | | |
| 2145 | 2150 | 2155 |
| Ala Gln Ser Gly Leu Phe Ala Leu Gln Ala Gly Leu Leu Gly Leu Leu | | |
| | | |

| | | |
|-----------------------------------------------------------------|------|------|
| 2165 | 2170 | 2175 |
| Gly Ser Trp Gly Val Arg Pro Asp Val Val Met Gly His Ser Val Gly | | |
| 2180 | 2185 | 2190 |
| Glu Leu Ala Ala Ala Phe Ala Ala Gly Val Leu Ser Leu Arg Asp Ala | | |
| 2195 | 2200 | 2205 |
| Ala Arg Leu Val Ala Ala Arg Ala Arg Leu Met Gln Ala Leu Pro Ser | | |
| 2210 | 2215 | 2220 |
| Asp Gly Ala Met Leu Ala Val Ala Ala Gly Glu Asp Leu Val Arg Pro | | |
| 2225 | 2230 | 2235 |
| Leu Leu Ala Gly Arg Glu Glu Ser Val Ser Val Ala Ala Leu Asn Ala | | |
| 2245 | 2250 | 2255 |
| Pro Gly Ser Val Val Leu Ser Gly Asp Arg Glu Val Leu Ala Ser Ile | | |
| 2260 | 2265 | 2270 |
| Val Gly Arg Leu Thr Glu Leu Arg Val Arg Thr Arg Arg Leu Arg Val | | |
| 2275 | 2280 | 2285 |
| Ser His Ala Phe His Ser His Arg Met Asp Pro Met Leu Gly Glu Phe | | |
| 2290 | 2295 | 2300 |
| Ala Gln Ile Ala Glu Ser Ala Glu Phe Gly Lys Pro Thr Thr Pro Leu | | |
| 2305 | 2310 | 2315 |
| Val Ser Thr Leu Thr Gly Glu Leu Asp Arg Ala Ala Glu Met Ser Thr | | |
| 2325 | 2330 | 2335 |
| Pro Gly Tyr Trp Val Arg Gln Ala Arg Glu Pro Val Arg Phe Ala Asp | | |
| 2340 | 2345 | 2350 |
| Gly Val Gln Ala Leu Ala Ala Gln Gly Ile Gly Thr Val Val Glu Leu | | |
| 2355 | 2360 | 2365 |
| Gly Pro Asp Gly Thr Leu Ala Ala Leu Val Arg Glu Cys Ala Thr Glu | | |
| 2370 | 2375 | 2380 |
| Ser Asp Arg Val Gly Arg Ile Ser Ser Ile Pro Leu Met Arg Arg Glu | | |
| 2385 | 2390 | 2395 |
| Arg Asp Glu Thr Arg Ser Val Met Thr Ala Leu Ala His Leu His Thr | | |
| 2405 | 2410 | 2415 |
| Arg Gly Gly Glu Val Asp Trp Gln Ala Phe Phe Ala Gly Thr Gly Ala | | |
| 2420 | 2425 | 2430 |
| Arg Gln Leu Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln His Tyr Trp | | |
| 2435 | 2440 | 2445 |
| Ile Glu Ser Ser Ala Arg Pro Ala Arg Asp Arg Ala Asp Ile Gly Glu | | |
| 2450 | 2455 | 2460 |
| Val Ala Glu Gln Phe Trp Thr Ala Val Asp Gln Gly Asp Leu Ala Thr | | |

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|-----------------------------------------------------------------|------|------|------|
| 2465 | 2470 | 2475 | 2480 |
| Leu Val Ala Ala Leu Asp Leu Gly Ala Asp Asp Thr Cys Ala Ser | 2485 | 2490 | 2495 |
| Leu Ser Asp Val Leu Pro Ala Leu Ser Ser Trp Arg Ser Gly Leu Arg | 2500 | 2505 | 2510 |
| Asn Arg Ser Leu Val Asp Ser Cys Arg Tyr Arg Ile Ser Trp His Ser | 2515 | 2520 | 2525 |
| Ser Arg Glu Val Pro Ala Pro Lys Ile Ser Gly Thr Trp Leu Leu Val | 2530 | 2535 | 2540 |
| Val Pro Gly Ala Ala Asp Asp Gly Leu Val Thr Ala Leu Thr Ser Ser | 2545 | 2550 | 2555 |
| Leu Val Gly Gly Gly Ala Glu Val Val Arg Ile Gly Leu Ser Glu Glu | 2565 | 2570 | 2575 |
| Asp Pro His Arg Glu Asp Val Ala Gln Arg Leu Ala Asn Ala Leu Thr | 2580 | 2585 | 2590 |
| Asp Ala Gly Gln Leu Gly Gly Val Leu Ser Leu Leu Gly Leu Asp Glu | 2595 | 2600 | 2605 |
| Ser Pro Ala Pro Gly Phe Ser Cys Leu Pro Thr Gly Phe Ala Leu Thr | 2610 | 2615 | 2620 |
| Val Gln Leu Leu Arg Ala Leu Arg Lys Ala Asp Val Glu Ala Pro Phe | 2625 | 2630 | 2635 |
| Trp Ala Val Thr Arg Gly Gly Val Ala Leu Glu Asp Val Arg Val Ser | 2645 | 2650 | 2655 |
| Pro Glu Gln Ala Leu Val Trp Gly Leu Leu Arg Val Ala Gly Leu Glu | 2660 | 2665 | 2670 |
| His Pro Glu Phe Trp Gly Gly Leu Ile Asp Leu Pro Ser Asp Trp Asp | 2675 | 2680 | 2685 |
| Asp Arg Leu Gly Ala Arg Leu Ala Gly Val Leu Ala Asp Gly Gly Glu | 2690 | 2695 | 2700 |
| Asp Gln Val Ala Ile Arg Arg Gly Gly Val Phe Val Arg Arg Leu Glu | 2705 | 2710 | 2715 |
| Arg Ala Gly Ala Ser Gly Ala Gly Ser Val Trp Arg Pro Arg Gly Thr | 2725 | 2730 | 2735 |
| Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala Arg | 2740 | 2745 | 2750 |
| Trp Leu Ala Gly Ala Gly Ala Glu His Val Val Leu Thr Ser Arg Arg | 2755 | 2760 | 2765 |
| Gly Ala Asp Ala Pro Gly Ala Gly Glu Leu Arg Ala Glu Leu Glu Ala | | | |

| | | |
|-----------------------------------------------------------------|------|-----------|
| 2770 | 2775 | 2780 |
| Leu Gly Ala Arg Val Ser Ile Val Pro Cys Asp Val Ala Asp Arg Asp | | |
| 2785 | 2790 | 2795 2800 |
| Ala Val Ala Gly Val Leu Ala Gly Ile Gly Gly Glu Cys Pro Leu Thr | | |
| 2805 | 2810 | 2815 |
| Ala Val Val His Ala Ala Gly Val Gly Glu Ala Gly Asp Val Val Glu | | |
| 2820 | 2825 | 2830 |
| Met Gly Leu Ala Asp Phe Ala Ala Val Leu Ser Ala Lys Val Arg Gly | | |
| 2835 | 2840 | 2845 |
| Ala Ala Asn Leu Asp Glu Leu Leu Ala Asp Ser Glu Leu Asp Ala Phe | | |
| 2850 | 2855 | 2860 |
| Val Met Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly Gln Gly | | |
| 2865 | 2870 | 2875 2880 |
| Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln Arg | | |
| 2885 | 2890 | 2895 |
| Arg Ala Arg Gly Leu Val Gly Thr Ala Val Ala Trp Gly Pro Trp Ala | | |
| 2900 | 2905 | 2910 |
| Gly Asp Gly Met Ala Ala Gly Glu Thr Gly Ala Gln Leu His Arg Met | | |
| 2915 | 2920 | 2925 |
| Gly Leu Ala Ser Met Glu Pro Ser Ala Ala Leu Leu Ala Leu Gln Gly | | |
| 2930 | 2935 | 2940 |
| Ala Leu Asp Arg Asp Glu Thr Ser Leu Val Val Ala Asp Val Asp Trp | | |
| 2945 | 2950 | 2955 2960 |
| Ala Arg Phe Ala Pro Ala Phe Thr Ser Ala Arg Arg Arg Pro Leu Leu | | |
| 2965 | 2970 | 2975 |
| Asp Thr Ile Asp Glu Ala Arg Ala Ala Leu Glu Thr Thr Gly Glu Gln | | |
| 2980 | 2985 | 2990 |
| Ala Gly Thr Gly Lys Pro Val Glu Leu Thr Gln Arg Leu Ala Gly Leu | | |
| 2995 | 3000 | 3005 |
| Ser Arg Lys Glu Arg Asp Asp Ala Val Leu Asp Leu Val Arg Ala Glu | | |
| 3010 | 3015 | 3020 |
| Thr Ala Ala Val Leu Gly Arg Asp Asp Ala Thr Ala Leu Ala Pro Ser | | |
| 3025 | 3030 | 3035 3040 |
| Arg Pro Phe Gln Glu Leu Gly Phe Asp Ser Leu Met Ala Val Glu Leu | | |
| 3045 | 3050 | 3055 |
| Arg Asn Arg Leu Asn Thr Ala Thr Gly Ile Gln Leu Pro Ala Ser Thr | | |
| 3060 | 3065 | 3070 |
| Ile Phe Asp Tyr Pro Asn Ala Glu Ser Leu Ser Arg His Leu Cys Ala | | |

| | | |
|-----------------------------------------------------------------|------|-----------|
| 3075 | 3080 | 3085 |
| Glu Leu Phe Pro Thr Glu Thr Thr Val Asp Ser Ala Leu Ala Glu Leu | | |
| 3090 | 3095 | 3100 |
| Asp Arg Ile Glu Gln Gln Leu Ser Met Leu Thr Gly Glu Ala Arg Ala | | |
| 3105 | 3110 | 3115 3120 |
| Arg Asp Arg Ile Ala Thr Arg Leu Arg Ala Leu His Glu Lys Trp Asn | | |
| 3125 | 3130 | 3135 |
| Ser Ala Ala Glu Val Pro Thr Gly Ala Asp Val Leu Ser Thr Leu Asp | | |
| 3140 | 3145 | 3150 |
| Ser Ala Thr His Asp Glu Ile Phe Glu Phe Ile Asp Asn Glu Leu Asp | | |
| 3155 | 3160 | 3165 |
| Leu Ser | | |
| 3170 | | |

<210> 47
 <211> 14775
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(14772)
 <223> ORF21; polyketide synthase

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|-----------------------------------------------------------------|-----|
| <400> 47 | |
| atg gcc aat gaa gaa aag ctc ttc ggc tat ctg aag aag gta act gcg | 48 |
| Met Ala Asn Glu Glu Lys Leu Phe Gly Tyr Leu Lys Lys Val Thr Ala | |
| 1 5 10 15 | |
| gac ctg cat cag acc cgg cag cgc ctg ctc gcg gcc gag agc cgg agt | 96 |
| Asp Leu His Gln Thr Arg Gln Arg Leu Leu Ala Ala Glu Ser Arg Ser | |
| 20 25 30 | |
| cag gag ccg atc gcg atc gtc tcg gcg agc tgc cga ctg ccc ggc ggc | 144 |
| Gln Glu Pro Ile Ala Ile Val Ser Ala Ser Cys Arg Leu Pro Gly Gly | |
| 35 40 45 | |
| gtc gac tct ccc gaa gcg ctc tgg caa ctc gtg cgc act ggc acc gac | 192 |
| Val Asp Ser Pro Glu Ala Leu Trp Gln Leu Val Arg Thr Gly Thr Asp | |
| 50 55 60 | |
| gcc atc tcg gag ttc ccc gcc gac cgg ggc tgg gat ctc ggc cgg ttg | 240 |
| Ala Ile Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp Leu Gly Arg Leu | |
| 65 70 75 80 | |
| tac gat ccc gac ccg aac cac cag gga acg tcg tac acg cgg gcc ggc | 288 |
| Tyr Asp Pro Asp Pro Asn His Gln Gly Thr Ser Tyr Thr Arg Ala Gly | |
| 85 90 95 | |

| | |
|-----------------------------------------------------------------|------|
| ggt ttc ctc gca gga gcg ggc gat ttc gac ccc gcc atg ttc ggg att | 336 |
| Gly Phe Leu Ala Gly Ala Gly Asp Phe Asp Pro Ala Met Phe Gly Ile | |
| 100 105 110 | |
| tcg ccg cgt gag gcg ttg gcg atg gac ccg cag caa cgg ttg ttg ctg | 384 |
| Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu | |
| 115 120 125 | |
| gag ctg tcc tgg gag gcc ctc gaa cgg gcg ggc ata gac ccg aca tcc | 432 |
| Glu Leu Ser Trp Glu Ala Leu Glu Arg Ala Gly Ile Asp Pro Thr Ser | |
| 130 135 140 | |
| ctg cgc ggc agc aag acc ggt gtc ttc ggt ggt gtc acg ccc cag gag | 480 |
| Leu Arg Gly Ser Lys Thr Gly Val Phe Gly Gly Val Thr Pro Gln Glu | |
| 145 150 155 160 | |
| tac ggg ccg tcc ttg cag gag atg agc cga aac gct ggg ggt ttt gga | 528 |
| Tyr Gly Pro Ser Leu Gln Glu Met Ser Arg Asn Ala Gly Gly Phe Gly | |
| 165 170 175 | |
| ctc acc ggg ccg atg gtg agt gtg gcg tcg ggt ccg gtt gcg tat tcg | 576 |
| Leu Thr Gly Arg Met Val Ser Val Ala Ser Gly Arg Val Ala Tyr Ser | |
| 180 185 190 | |
| ttt ggt ttt gag ggt cct gcg gtg acg gtg gat acg gcg tgt tcg tcg | 624 |
| Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser | |
| 195 200 205 | |
| tcg ttg gtg gcc ctg cat ttg gcg tgt cag tcg ttg cgt tcc ggc gaa | 672 |
| Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Ser Gly Glu | |
| 210 215 220 | |
| tgc gat ctc gcg ctg gcc ggc ggt gtg acg gtg atg gcg aca ccg gcg | 720 |
| Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala Thr Pro Ala | |
| 225 230 235 240 | |
| acg ttc gtg gag ttc tcc cgt cag cgt ggt ttg gct ccg gac ggg ccg | 768 |
| Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg | |
| 245 250 255 | |
| tgc aag tcg ttc gcg gct gcc gcg gat ggc acc ggg tgg ggt gag ggt | 816 |
| Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly | |
| 260 265 270 | |
| gcc ggt ctg gtg ttg ctg gag cgg ttg tcg gat gcg ccg ccg aat ggg | 864 |
| Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly | |
| 275 280 285 | |
| cac gag gtt ctg gcg gtg gtg cgg ggt agc gcg gtg aac cag gac ggc | 912 |
| His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly | |
| 290 295 300 | |
| gcg tcg aat ggt ttg act gcg ccg aat ggt ccg tcg cag cag ccg gtg | 960 |
| Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val | |
| 305 310 315 320 | |
| atc acc cag gcg ttg gcg agt gcg ggg ctg tcg gtt tcc gat gtg gat | 1008 |

| | |
|-----------------------------------------------------------------|------|
| Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp | |
| 325 330 335 | |
| gcg gtc gag gca cat ggg acc ggg acc acg ttg ggt gat ccg atc gag | 1056 |
| Ala Val Glu Ala His Gly Thr Gly Thr Leu Gly Asp Pro Ile Glu | |
| 340 345 350 | |
| gca cag gcc ctg atc gcc acg tac ggg cag ggc cgg gag aag gat cgg | 1104 |
| Ala Gln Ala Leu Ile Ala Thr Tyr Gly Gln Gly Arg Glu Lys Asp Arg | |
| 355 360 365 | |
| ccg ttg tgg ttg ggg tcg gtc aag tcc aac atc ggt cac acg cag gcg | 1152 |
| Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His Thr Gln Ala | |
| 370 375 380 | |
| gcc gct ggc gtt gcc ggc gtc atc aag atg gtc ttg gcg atg cgg cac | 1200 |
| Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His | |
| 385 390 395 400 | |
| ggg cag ctg ccc gcc acg ttg cat gtg gat gag ccc acg tcg gcg gtg | 1248 |
| Gly Gln Leu Pro Ala Thr Leu His Val Asp Glu Pro Thr Ser Ala Val | |
| 405 410 415 | |
| gac tgg tcg gcg ggt tcg gtc cgg ctt ctc acg gag aac acg ccc tgg | 1296 |
| Asp Trp Ser Ala Gly Ser Val Arg Leu Leu Thr Glu Asn Thr Pro Trp | |
| 420 425 430 | |
| ccg gac agt ggt cgt cct tgc cgg gtg ggg gtg tcg tcg ttc ggg atc | 1344 |
| Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser Ser Phe Gly Ile | |
| 435 440 445 | |
| agc ggc acc aac gca cat gtg att ctc gaa cag tct cca gtc gag cag | 1392 |
| Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser Pro Val Glu Gln | |
| 450 455 460 | |
| ggc gaa ccg gcc ggg ccg gtc gaa ggc gag cgg gaa ccg gat gta gcc | 1440 |
| Gly Glu Pro Ala Gly Pro Val Glu Gly Glu Arg Glu Pro Asp Val Ala | |
| 465 470 475 480 | |
| gtc ccc gtg gtg cct tgg gtg ctg tcg ggt aag aca ccg gag gct gcg | 1488 |
| Val Pro Val Val Pro Trp Val Leu Ser Gly Lys Thr Pro Glu Ala Ala | |
| 485 490 495 | |
| cgg gcg cag gcc gaa cgg gtg cat tcg cat atc gag gac cgg ccg ggg | 1536 |
| Arg Ala Gln Ala Glu Arg Val His Ser His Ile Glu Asp Arg Pro Gly | |
| 500 505 510 | |
| ctg tcg ccg gtg gat gtg gcg tat tcg cta gga atg aca cgc gcg gcg | 1584 |
| Leu Ser Pro Val Asp Val Ala Tyr Ser Leu Gly Met Thr Arg Ala Ala | |
| 515 520 525 | |
| ctg gat gaa cgc gca gtg gtg ttg ggc tcg gac cgt gcc gcg ctc ctg | 1632 |
| Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Ala Ala Leu Leu | |
| 530 535 540 | |
| acc ggg ttg agg gca ttc gcc gac ggc tgc gat gcg ccc gaa gtg gtt | 1680 |
| Thr Gly Leu Arg Ala Phe Ala Asp Gly Cys Asp Ala Pro Glu Val Val | |

| 545 | 550 | 555 | 560 | |
|-----------------------------------------------------------------|-----|-----|-----|------|
| tcg ggg tct gtg ggg ctt ggt ggc cgc gtc ggg ttc gtg ttc tcg ggt | | | | 1728 |
| Ser Gly Ser Val Gly Leu Gly Gly Arg Val Gly Phe Val Phe Ser Gly | 565 | 570 | 575 | |
| cag ggt ggt cag tgg ccg ggg atg ggc cgg ggg ctc tac tcg gtg ttt | | | | 1776 |
| Gln Gly Gly Gln Trp Pro Gly Met Gly Arg Gly Leu Tyr Ser Val Phe | 580 | 585 | 590 | |
| ccg gtg ttc gcc gac gcg ttc gac gag gct tgc gcg gag ttg gat gca | | | | 1824 |
| Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala | 595 | 600 | 605 | |
| cac ctg ggc cag gaa ctg cgg gtt cgg gat gtg gtg ttc ggt tcg caa | | | | 1872 |
| His Leu Gly Gln Glu Leu Arg Val Arg Asp Val Val Phe Gly Ser Gln | 610 | 615 | 620 | |
| gcg tgg ttg ctg gat cgg acg gtg tgg gcg cag tcg ggt ttg ttc gcg | | | | 1920 |
| Ala Trp Leu Leu Asp Arg Thr Val Trp Ala Gln Ser Gly Leu Phe Ala | 625 | 630 | 635 | 640 |
| ttg cag att ggc ttg ctg cgg ctg ctg ggt tcg tgg ggt gtt cgg ccg | | | | 1968 |
| Leu Gln Ile Gly Leu Leu Arg Leu Leu Gly Ser Trp Gly Val Arg Pro | 645 | 650 | 655 | |
| gat gtg gtg ttg ggg cac tcg gtg ggt gag ctg gct gcg gtg cat gcg | | | | 2016 |
| Asp Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Val His Ala | 660 | 665 | 670 | |
| gct ggt gtg ttg tcg ttg tcg gag gcc gcg cgg ttg gtg gcg ggt cgc | | | | 2064 |
| Ala Gly Val Leu Ser Leu Ser Glu Ala Ala Arg Leu Val Ala Gly Arg | 675 | 680 | 685 | |
| gcc cgg ttg atg cag gcg ttg cct tct ggt ggt gcc atg ctc gcg gtc | | | | 2112 |
| Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala Met Leu Ala Val | 690 | 695 | 700 | |
| gct acg ggt gag ttt cag gtc gat cct ctg ctg gat ggg gtg cgg gac | | | | 2160 |
| Ala Thr Gly Glu Phe Gln Val Asp Pro Leu Leu Asp Gly Val Arg Asp | 705 | 710 | 715 | 720 |
| cgg atc ggt atc gcg gcg gtg aat ggc ccg gaa tcg gtt gtg ctc tct | | | | 2208 |
| Arg Ile Gly Ile Ala Ala Val Asn Gly Pro Glu Ser Val Val Leu Ser | 725 | 730 | 735 | |
| ggt gac cgc gag ctg ctc acc gag atc gct gat cgg ttg cac gat cag | | | | 2256 |
| Gly Asp Arg Glu Leu Leu Thr Glu Ile Ala Asp Arg Leu His Asp Gln | 740 | 745 | 750 | |
| ggg tgc cgg acc cgg tgg ttg cgg gtg tcg cat gct ttc cat tcg ccc | | | | 2304 |
| Gly Cys Arg Thr Arg Trp Leu Arg Val Ser His Ala Phe His Ser Pro | 755 | 760 | 765 | |
| cat atg gag ccg atg ctg gag gag ttc gcc cag atc tcc cga ggc cgc | | | | 2352 |
| His Met Glu Pro Met Leu Glu Glu Phe Ala Gln Ile Ser Arg Gly Arg | 770 | 775 | 780 | |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|
| gaa tat cac gca ccg gaa ctg ccg atc atc tcg acc ctg atc ggt gag Glu Tyr His Ala Pro Glu Leu Pro Ile Ile Ser Thr Leu Ile Gly Glu 785 790 795 800 | | | | | | | | | | | | | | | | | 2400 |
| ctg gac ggt ggt cga gtg atg ggc act ccc gag tac tgg gtg cgt cag Leu Asp Gly Gly Arg Val Met Gly Thr Pro Glu Tyr Trp Val Arg Gln 805 810 815 | | | | | | | | | | | | | | | | | 2448 |
| gtg cgt gag ccc gtc cgt ttc gcc gag ggt gtc cag gcg ctt gtc ggt Val Arg Glu Pro Val Arg Phe Ala Glu Gly Val Gln Ala Leu Val Gly 820 825 830 | | | | | | | | | | | | | | | | | 2496 |
| cag ggt gtc ggc acg att gtc gaa ttg ggt ccg gac ggg gcg ttg tcg Gln Gly Val Gly Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu Ser 835 840 845 | | | | | | | | | | | | | | | | | 2544 |
| acg ttg gtc gag gag tgt gtg gcg gaa tcc ggg cgg gtg gcc ggg atc Thr Leu Val Glu Glu Cys Val Ala Glu Ser Gly Arg Val Ala Gly Ile 850 855 860 | | | | | | | | | | | | | | | | | 2592 |
| ccg ctg atg cgc aag gac cgc gac gag gcg cga acc gtg ctg gca gct Pro Leu Met Arg Lys Asp Arg Asp Glu Ala Arg Thr Val Leu Ala Ala 865 870 875 880 | | | | | | | | | | | | | | | | | 2640 |
| ttg gcg cag atc cac acc cgt ggt ggt gag gtg gac tgg cgg tcg ttt Leu Ala Gln Ile His Thr Arg Gly Gly Glu Val Asp Trp Arg Ser Phe 885 890 895 | | | | | | | | | | | | | | | | | 2688 |
| ttc gcc ggt acc ggg gcg aag caa gtc gac ctg ccc acc tac gcc ttc Phe Ala Gly Thr Gly Ala Lys Gln Val Asp Leu Pro Thr Tyr Ala Phe 900 905 910 | | | | | | | | | | | | | | | | | 2736 |
| cag cgg cag cgg tac tgg ctg gca tcc acc ggg cgt gcg ggt gac gtg Gln Arg Gln Arg Tyr Trp Leu Ala Ser Thr Gly Arg Ala Gly Asp Val 915 920 925 | | | | | | | | | | | | | | | | | 2784 |
| acc gcc gcc gga ttg gcc gag gcg gac cat ccg ctg ctc ggt gcg gtg Thr Ala Ala Gly Leu Ala Glu Ala Asp His Pro Leu Leu Gly Ala Val 930 935 940 | | | | | | | | | | | | | | | | | 2832 |
| gtt gcg ttg gca gac ggc gaa ggt gtg gtg ctg acc ggt cgg ttg aca Val Ala Leu Ala Asp Gly Glu Gly Val Val Leu Thr Gly Arg Leu Thr 945 950 955 960 | | | | | | | | | | | | | | | | | 2880 |
| gcg ggt tcg cat ccg tgg ttg tcc gat cac cgg gtg ctg ggc gaa atc Ala Gly Ser His Pro Trp Leu Ser Asp His Arg Val Leu Gly Glu Ile 965 970 975 | | | | | | | | | | | | | | | | | 2928 |
| gtc gtc ccc ggc acc gcg atc gtc gag ctg gtg tgg cac gtc ggc gag Val Val Pro Gly Thr Ala Ile Val Glu Leu Val Trp His Val Gly Glu 980 985 990 | | | | | | | | | | | | | | | | | 2976 |
| cgc ctc ggt tgt ggc cgg gtg gaa gaa ctg gct ttg gaa gcg ccc ctg Arg Leu Gly Cys Gly Arg Val Glu Glu Leu Ala Leu Glu Ala Pro Leu 995 1000 1005 | | | | | | | | | | | | | | | | | 3024 |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| atc ctg ccg gat cat gga gcg gtc cag gtt cag gtg ctg gtg gga ccg Ile Leu Pro Asp His Gly Ala Val Gln Val Gln Val Leu Val Gly Pro 1010 1015 1020 | 3072 |
| ccc ggg gaa tcc gga gcc cgg tcg gtg gcg ctc tac tcc tgt cct ggc Pro Gly Glu Ser Gly Ala Arg Ser Val Ala Leu Tyr Ser Cys Pro Gly 1025 1030 1035 1040 | 3120 |
| gag gcg atc gaa ccc gag tgg aag aag cac gcg acg ggc gtg ctt ctc Glu Ala Ile Glu Pro Glu Trp Lys Lys His Ala Thr Gly Val Leu Leu 1045 1050 1055 | 3168 |
| cca ccc gtg gcc gcc gag aac cat gag ctg acc gca tgg ccc ccg gag Pro Pro Val Ala Ala Glu Asn His Glu Leu Thr Ala Trp Pro Pro Glu 1060 1065 1070 | 3216 |
| aat gcg acc gaa atc gat gca gac ggg gtc tac gca ttc ctt gaa ggg Asn Ala Thr Glu Ile Asp Ala Asp Gly Val Tyr Ala Phe Leu Glu Gly 1075 1080 1085 | 3264 |
| cac ggt ttc gcg tac gga ccg gcc ttt aga tgt ctg cgc ggt gcc tgg His Gly Phe Ala Tyr Gly Pro Ala Phe Arg Cys Leu Arg Gly Ala Trp 1090 1095 1100 | 3312 |
| cga cga ggc ggg gag gtg ttc gcc gaa gtc gca ttg ccg gat gac atg Arg Arg Gly Gly Glu Val Phe Ala Glu Val Ala Leu Pro Asp Asp Met 1105 1110 1115 1120 | 3360 |
| cag gcg ggg gtc gat cga ttc ggc gtc cac ccc gcg ttg ctg gac gcg Gln Ala Gly Val Asp Arg Phe Gly Val His Pro Ala Leu Leu Asp Ala 1125 1130 1135 | 3408 |
| gtt ctg cat gcc gcc gca gcc gag acg tcg gtg gtc cag agc gaa gcg Val Leu His Ala Ala Ala Ala Glu Thr Ser Val Val Gln Ser Glu Ala 1140 1145 1150 | 3456 |
| cgg gtg ccg ttc tcg tgg cgt ggg gtg gaa ctt cgc gcc act gaa agc Arg Val Pro Phe Ser Trp Arg Gly Val Glu Leu Arg Ala Thr Glu Ser 1155 1160 1165 | 3504 |
| gcg gtg gtg ccg gcg cgc ctc tcg ttg act tcg gat gac gaa ctg tcg Ala Val Val Arg Ala Arg Leu Ser Leu Thr Ser Asp Asp Glu Leu Ser 1170 1175 1180 | 3552 |
| ttg gtc gca gtg gac ccg gct ggc cga ttc gtg gcc acg gtt gat tcg Leu Val Ala Val Asp Pro Ala Gly Arg Phe Val Ala Thr Val Asp Ser 1185 1190 1195 1200 | 3600 |
| ctg gtg acc cga ccg atc tcc cgg cag cag gtg agg tct ggc gcg atc Leu Val Thr Arg Pro Ile Ser Arg Gln Gln Val Arg Ser Gly Ala Ile 1205 1210 1215 | 3648 |
| ggt gat tgc ctg ttc gag gtg gag tgg cac cgg aag gcg ttg ttg gga Gly Asp Cys Leu Phe Glu Val Glu Trp His Arg Lys Ala Leu Leu Gly 1220 1225 1230 | 3696 |
| aca acc gcc ggc gac gac ctt gcc atc gtc ggt gac ggt ccc agt tgg | 3744 |

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|-----------------------------------------------------------------|------|
| Thr Thr Ala Gly Asp Asp Leu Ala Ile Val Gly Asp Gly Pro Ser Trp | |
| 1235 1240 1245 | |
| ccg gaa tcg gtg cgc gca acc gca cgg ttc gcg acc ctg gat gag ttc | 3792 |
| Pro Glu Ser Val Arg Ala Thr Ala Arg Phe Ala Thr Leu Asp Glu Phe | |
| 1250 1255 1260 | |
| cgt gcg gcc gtg gac tcg gac gtt cct gcc ccg ggt tcg gtg ttg gtc | 3840 |
| Arg Ala Ala Val Asp Ser Asp Val Pro Ala Pro Gly Ser Val Leu Val | |
| 1265 1270 1275 1280 | |
| gca gct atg tcg gcc gaa gag gtc gag ggt gga tcc ctg ccg tcg cgc | 3888 |
| Ala Ala Met Ser Ala Glu Glu Val Glu Gly Gly Ser Leu Pro Ser Arg | |
| 1285 1290 1295 | |
| gcc caa gag tcg acc tcc gat ctg ctg gct ctc gtg cag tcg tgg ctt | 3936 |
| Ala Gln Glu Ser Thr Ser Asp Leu Leu Ala Leu Val Gln Ser Trp Leu | |
| 1300 1305 1310 | |
| gcg gac gag cgg ttc gcc gaa tcc cag ctc gtg gtc gtc acg cgt gca | 3984 |
| Ala Asp Glu Arg Phe Ala Glu Ser Gln Leu Val Val Val Thr Arg Ala | |
| 1315 1320 1325 | |
| gcg gtg tcg gcc gac tcg gat tcg gac gtc gcg gac ctg gtg ggt gcg | 4032 |
| Ala Val Ser Ala Asp Ser Asp Ser Asp Val Ala Asp Leu Val Gly Ala | |
| 1330 1335 1340 | |
| tcg tcg tgg ggg ttg ttg agt tca gcc cag tcg gag aac ccg ggt cgc | 4080 |
| Ser Ser Trp Gly Leu Leu Ser Ser Ala Gln Ser Glu Asn Pro Gly Arg | |
| 1345 1350 1355 1360 | |
| ttc gtg ctg gtg gac gtg gac ggc aca cct gag tcg tgg cag gcg ttg | 4128 |
| Phe Val Leu Val Asp Val Asp Gly Thr Pro Glu Ser Trp Gln Ala Leu | |
| 1365 1370 1375 | |
| ccg gcc gcc gtg cga gca gga gaa ccg cag ctg gca ctt ccg cgc ggc | 4176 |
| Pro Ala Ala Val Arg Ala Gly Glu Pro Gln Leu Ala Leu Arg Arg Gly | |
| 1380 1385 1390 | |
| gtg gcg ctg gtg cct ccg ttg gcg cga ctc acg gtg cgc gag gag ggc | 4224 |
| Val Ala Leu Val Pro Arg Leu Ala Arg Leu Thr Val Arg Glu Glu Gly | |
| 1395 1400 1405 | |
| tcc tcc ccg caa ctc gac acg gac ggg acc gtc ctc atc acg ggt ggc | 4272 |
| Ser Ser Pro Gln Leu Asp Thr Asp Gly Thr Val Leu Ile Thr Gly Gly | |
| 1410 1415 1420 | |
| acc ggt gcg ttg ggg gga gtg gtt gcc cgt cac ctg gtg gag gag cac | 4320 |
| Thr Gly Ala Leu Gly Gly Val Val Ala Arg His Leu Val Glu Glu His | |
| 1425 1430 1435 1440 | |
| ggg att ccg cgt ttg gtg ttg gca ggc ccg cgt ggc tgg aat gcg cct | 4368 |
| Gly Ile Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp Asn Ala Pro | |
| 1445 1450 1455 | |
| gga gtc cac gag ttg gtg gat gag ctg gcg cgc gcg ggc gcc gtg gtt | 4416 |
| Gly Val His Glu Leu Val Asp Glu Leu Ala Arg Ala Gly Ala Val Val | |

| 1460 | 1465 | 1470 | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| gag gtg gtg gct tgc gat gtg gct gac cgc acc gat ctg gag cac gtg Glu Val Val Ala Cys Asp Val Ala Asp Arg Thr Asp Leu Glu His Val 1475 1480 1485 | | | 4464 |
| ctg gcc gcc att ccg gtc gac tgg ccg ctg cgg ggg atc gtg cat acc Leu Ala Ala Ile Pro Val Asp Trp Pro Leu Arg Gly Ile Val His Thr 1490 1495 1500 | | | 4512 |
| gct ggg gtg ctg gcc gac gga gtg atc ggg tcc ttg tcg gcg gcg gat Ala Gly Val Leu Ala Asp Gly Val Ile Gly Ser Leu Ser Ala Ala Asp 1505 1510 1515 1520 | | | 4560 |
| gtg ggc acg gtg ttt gcc ccg aag gtg acg ggg gca tgg cat ctg cac Val Gly Thr Val Phe Ala Pro Lys Val Thr Gly Ala Trp His Leu His 1525 1530 1535 | | | 4608 |
| gag ttg acc cgc gat ctg gat ctg tcg ttc ttc gtt ctt ttc tct tcc Glu Leu Thr Arg Asp Leu Asp Leu Ser Phe Phe Val Leu Phe Ser Ser 1540 1545 1550 | | | 4656 |
| ttc tcc ggg att gcg ggt gcc gca ggg cag gcc aac tac gcg gcg gcg Phe Ser Gly Ile Ala Gly Ala Ala Gly Gln Ala Asn Tyr Ala Ala Ala 1555 1560 1565 | | | 4704 |
| aac acg ttc ctg gat gca ttg gcg cgt tat cgc cgg gcg cgt ggg ctg Asn Thr Phe Leu Asp Ala Leu Ala Arg Tyr Arg Arg Ala Arg Gly Leu 1570 1575 1580 | | | 4752 |
| cct ggg ttg tcg ttg gcg tgg gga ctg tgg gcg caa ccc agc ggt atg Pro Gly Leu Ser Leu Ala Trp Gly Leu Trp Ala Gln Pro Ser Gly Met 1585 1590 1595 1600 | | | 4800 |
| acg agt ggc ttg gac gcg gcg tcg gtg gag cgg ttg gcg cgg acg ggc Thr Ser Gly Leu Asp Ala Ala Ser Val Glu Arg Leu Ala Arg Thr Gly 1605 1610 1615 | | | 4848 |
| atc gca gaa ctt tcc acg gag gat gga ctc cgc ctg ttc gat gcc gcg Ile Ala Glu Leu Ser Thr Glu Asp Gly Leu Arg Leu Phe Asp Ala Ala 1620 1625 1630 | | | 4896 |
| ttc gcg aag gac cgg gct tgc gtc gtt gcc gct cga ttg gac agg gcg Phe Ala Lys Asp Arg Ala Cys Val Val Ala Ala Arg Leu Asp Arg Ala 1635 1640 1645 | | | 4944 |
| ctg ctg gtc ggg aac gga cga tcg cac gcg att ccg gcg ctg ttg agc Leu Leu Val Gly Asn Gly Arg Ser His Ala Ile Pro Ala Leu Leu Ser 1650 1655 1660 | | | 4992 |
| gcg ttg gtt cct gtt cgc ggc ggt gtg gcg agg aaa aca gcc aat tct Ala Leu Val Pro Val Arg Gly Gly Val Ala Arg Lys Thr Ala Asn Ser 1665 1670 1675 1680 | | | 5040 |
| cag gcc gcg gat gag gac gca ctg ttg ggt ttg gtg cgg gag cac gtt Gln Ala Ala Asp Glu Asp Ala Leu Leu Gly Leu Val Arg Glu His Val 1685 1690 1695 | | | 5088 |

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|-----------------------------------------------------------------|------|
| tcg gcc gtg ctg ggt tat tcg ggt gcg gtc gag gtt ggg ggc gac cgt | 5136 |
| Ser Ala Val Leu Gly Tyr Ser Gly Ala Val Glu Val Gly Gly Asp Arg | |
| 1700 1705 1710 | |
| gct ttc cgt gat ctg ggt ttt gat tcg ttg tct ggc gtg gag ttg cgg | 5184 |
| Ala Phe Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Leu Arg | |
| 1715 1720 1725 | |
| aac cgc ctt gcc ggg gtg ctg ggg gtg cgg ttg ccg gcg act gcg gtg | 5232 |
| Asn Arg Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val | |
| 1730 1735 1740 | |
| ttc gac tat ccg acg ccg cgg gcg ctg gcg cgt ttc ctg cat cag gaa | 5280 |
| Phe Asp Tyr Pro Thr Pro Arg Ala Leu Ala Arg Phe Leu His Gln Glu | |
| 1745 1750 1755 1760 | |
| ctg gca ggc gag gtc gcg tcc acg tcg acg ccg gtg acc agg gca gcg | 5328 |
| Leu Ala Gly Glu Val Ala Ser Thr Ser Thr Pro Val Thr Arg Ala Ala | |
| 1765 1770 1775 | |
| agt gcc gaa gag gat ctt gtt gcg att gtc ggg atg gga tgt cgt ttt | 5376 |
| Ser Ala Glu Glu Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe | |
| 1780 1785 1790 | |
| ccg ggt ggg gtg tcg tcg ccg gag gag ctt tgg cgg ctg gtg gcc ggc | 5424 |
| Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly | |
| 1795 1800 1805 | |
| ggc gtg gat gcg gtg gct ggg ttc cca gac gat cgc ggc tgg gat ctc | 5472 |
| Gly Val Asp Ala Val Ala Gly Phe Pro Asp Asp Arg Gly Trp Asp Leu | |
| 1810 1815 1820 | |
| gcg gcg ttg tac gat cct gat ccc gat cgt ctc ggg acc tcg tat gtg | 5520 |
| Ala Ala Leu Tyr Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr Val | |
| 1825 1830 1835 1840 | |
| tgt gag ggc ggg ttt ctg cgg gac gcg gcg gag ttc gat gct gac atg | 5568 |
| Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Asp Met | |
| 1845 1850 1855 | |
| ttc ggc atc agc ccg cgt gag gcg ttg gcg atg gat ccg cag cag cgg | 5616 |
| Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg | |
| 1860 1865 1870 | |
| ttg ctg ctg gag gtc gcc tgg gaa acc ttg gag cgg gct ggg atc gat | 5664 |
| Leu Leu Leu Glu Val Ala Trp Glu Thr Leu Glu Arg Ala Gly Ile Asp | |
| 1875 1880 1885 | |
| ccg ttc tcg ttg cac ggc agc cgg acc ggt gtg ttc gcg ggc ttg atg | 5712 |
| Pro Phe Ser Leu His Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met | |
| 1890 1895 1900 | |
| tac cac gac tat ggg gcc cga ttc att acc aga gca ccg gag ggc ttc | 5760 |
| Tyr His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly Phe | |
| 1905 1910 1915 1920 | |

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|-----------------------------------------------------------------|------|
| gaa ggg cac ctc ggg acg ggc aat gcg ggg agc gtg ctg tcg ggt cgg | 5808 |
| Glu Gly His Leu Gly Thr Gly Asn Ala Gly Ser Val Leu Ser Gly Arg | |
| 1925 1930 1935 | |
| ggt gcg tat tcg ttt ggt ttc gag ggt cct gcg gtg acg gtg gat acg | 5856 |
| Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr | |
| 1940 1945 1950 | |
| gcg tgt tcg tcg tcg ttg gtg gcg tta cac ctg gcg ggt caa gca ctg | 5904 |
| Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu | |
| 1955 1960 1965 | |
| cgg gcc ggt gag tgc gaa ttc gcc ctt gcc ggt ggc gtc acg gtg atg | 5952 |
| Arg Ala Gly Glu Cys Glu Phe Ala Leu Ala Gly Gly Val Thr Val Met | |
| 1970 1975 1980 | |
| tcg acg ccg acg acg ttc gtg gag ttc tcc cgt caa cgg ggt ctg gct | 6000 |
| Ser Thr Pro Thr Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala | |
| 1985 1990 1995 2000 | |
| ccg gat ggg cgg tgc aag tcg ttc gcg gcg gcc gcg gat ggc acc ggg | 6048 |
| Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Asp Gly Thr Gly | |
| 2005 2010 2015 | |
| tgg ggc gag ggt gcc ggt ctg gtg ttg ctg gag cgg ttg tcg gat gcc | 6096 |
| Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala | |
| 2020 2025 2030 | |
| cgg cgc aat ggg cac gag gtt ctg gcg gtg gtg cgg ggt agc gcg gtg | 6144 |
| Arg Arg Asn Gly His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val | |
| 2035 2040 2045 | |
| aac cag gac ggc gcg tcg aat ggc ttg act gcg cca aat ggt ccg tca | 6192 |
| Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser | |
| 2050 2055 2060 | |
| cag caa agg gtg atc acc cag gca ctc acg agt gcc ggg ctg tcc gtg | 6240 |
| Gln Gln Arg Val Ile Thr Gln Ala Leu Thr Ser Ala Gly Leu Ser Val | |
| 2065 2070 2075 2080 | |
| tcc gac gtg gat gct gtg gag gcg cat ggg acg ggc acg cgg ctt ggt | 6288 |
| Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly | |
| 2085 2090 2095 | |
| gat ccg atc gag gcg cag gcg ttg atc gct acg tac ggc cgg gat cgt | 6336 |
| Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg | |
| 2100 2105 2110 | |
| gat ccc ggt cgg ccg ttg tgg ctg ggg tcg gtg aag tcg aat att ggt | 6384 |
| Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly | |
| 2115 2120 2125 | |
| cac acc cag gcg gcg gcg ggt gtc gct ggt gtg atc aag atg gtg atg | 6432 |
| His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met | |
| 2130 2135 2140 | |
| gcg atg cgg cag ggg gag ctg ccg cgc acg ttg cac gtg gac gag ccc | 6480 |

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|-----------------------------------------------------------------|------|------|------|------|--|
| Ala Met Arg Gln Gly Glu Leu Pro Arg Thr Leu His Val Asp Glu Pro | 2145 | 2150 | 2155 | 2160 | |
| tcc gcg cag gtg gac tgg tct gcg ggc acg gtc caa ctc ctc acg gag | 6528 | | | | |
| Ser Ala Gln Val Asp Trp Ser Ala Gly Thr Val Gln Leu Leu Thr Glu | | 2165 | 2170 | 2175 | |
| aac acg ccc tgg ccc gac agc ggt cgt ctt cgc cgg gcg ggc gtg tca | 6576 | | | | |
| Asn Thr Pro Trp Pro Asp Ser Gly Arg Leu Arg Arg Ala Gly Val Ser | | 2180 | 2185 | 2190 | |
| tcg ttc ggg atc agt ggc acc aac gcg cac ctg atc ctt gaa caa cct | 6624 | | | | |
| Ser Phe Gly Ile Ser Gly Thr Asn Ala His Leu Ile Leu Gln Pro | | 2195 | 2200 | 2205 | |
| ccg cga gag tcg cag cgc tca aca gag ccg gat tcg ggt tct gtc cgc | 6672 | | | | |
| Pro Arg Glu Ser Gln Arg Ser Thr Glu Pro Asp Ser Gly Ser Val Arg | | 2210 | 2215 | 2220 | |
| gat ttt ccg gtg gtg ccg tgg atg gtg tcg ggc aaa aca ccc gaa gcg | 6720 | | | | |
| Asp Phe Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala | | 2230 | 2235 | 2240 | |
| cta tcc gcc cag gca gat gca ttg atg tcc tac ttg agc aat cgc gtt | 6768 | | | | |
| Leu Ser Ala Gln Ala Asp Ala Leu Met Ser Tyr Leu Ser Asn Arg Val | | 2245 | 2250 | 2255 | |
| gat gct tcc ccg cga gat atc ggt tat tcg ctt gcg gtg acc cgt ccg | 6816 | | | | |
| Asp Ala Ser Pro Arg Asp Ile Gly Tyr Ser Leu Ala Val Thr Arg Pro | | 2260 | 2265 | 2270 | |
| gcg ttg gac cac cgc gct gtc gtg ctg ggt gcg gat cgt gcc gcg ttg | 6864 | | | | |
| Ala Leu Asp His Arg Ala Val Val Leu Gly Ala Asp Arg Ala Ala Leu | | 2275 | 2280 | 2285 | |
| ctg ccg ggc ttg aaa gcg ctg gcc gtt agt aat gac gct gcc gag gtg | 6912 | | | | |
| Leu Pro Gly Leu Lys Ala Leu Ala Val Ser Asn Asp Ala Ala Glu Val | | 2290 | 2295 | 2300 | |
| atc acc ggc act cgt gcc gct ggg ccg gtc gga ttc gtg ttc tcc ggt | 6960 | | | | |
| Ile Thr Gly Thr Arg Ala Ala Gly Pro Val Gly Phe Val Phe Ser Gly | | 2310 | 2315 | 2320 | |
| caa ggt ggt cag tgg ccc ggg atg gga agc ggg ctc cac tcg gcg ttt | 7008 | | | | |
| Gln Gly Gly Gln Trp Pro Gly Met Gly Ser Gly Leu His Ser Ala Phe | | 2325 | 2330 | 2335 | |
| ccg gtg ttc gcc gac gcg ttt gac gaa gcc tgc tgc gag ctg gat gcg | 7056 | | | | |
| Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Cys Glu Leu Asp Ala | | 2340 | 2345 | 2350 | |
| cat ctc ggg cag atg gcc cgg cta cga gat gtg ttg tcc ggt tcg gat | 7104 | | | | |
| His Leu Gly Gln Met Ala Arg Leu Arg Asp Val Leu Ser Gly Ser Asp | | 2355 | 2360 | 2365 | |
| acg caa ctt ctg gac cag acc ttg tgg gcg cag ccg ggc ctg ttc gcg | 7152 | | | | |
| Thr Gln Leu Leu Asp Gln Thr Leu Trp Ala Gln Pro Gly Leu Phe Ala | | | | | |

| 2370 | 2375 | 2380 | |
|-----------------------------------------------------------------|------|------|------|
| ttg caa gtc gga ctc tgg gag ttg ttg ggt tgc tgg ggt gtc cgg ccc | | | 7200 |
| Leu Gln Val Gly Leu Trp Glu Leu Leu Gly Ser Trp Gly Val Arg Pro | | | |
| 2385 | 2390 | 2395 | 2400 |
| gct gtg gtg ctg ggc cac tgc gtc ggt gag ctg gcg gcg gcg ttc gcg | | | 7248 |
| Ala Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe Ala | | | |
| 2405 | 2410 | 2415 | |
| gct gga gtg ttg tgc ttg cgg gat gcg gct cgg ctg gtg gcg ggc cgt | | | 7296 |
| Ala Gly Val Leu Ser Leu Arg Asp Ala Ala Arg Leu Val Ala Gly Arg | | | |
| 2420 | 2425 | 2430 | |
| gcc cgg ttg atg caa gcc ctg cca act ggc ggt gcc atg ctc gct gcg | | | 7344 |
| Ala Arg Leu Met Gln Ala Leu Pro Thr Gly Gly Ala Met Leu Ala Ala | | | |
| 2435 | 2440 | 2445 | |
| gct gct gga gag gag cag ctg cgc ccg ttg ctg gcc gac tgc ggt gat | | | 7392 |
| Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala Asp Cys Gly Asp | | | |
| 2450 | 2455 | 2460 | |
| cgt gtg ggg atc gcc gcg gtc aac gct ccc ggg tgc gtg gtg ctc tcc | | | 7440 |
| Arg Val Gly Ile Ala Ala Val Asn Ala Pro Gly Ser Val Val Leu Ser | | | |
| 2465 | 2470 | 2475 | 2480 |
| ggt gat cgg gat gtg ctc gat gac att gcc ggt cgg ctg gac ggg caa | | | 7488 |
| Gly Asp Arg Asp Val Leu Asp Asp Ile Ala Gly Arg Leu Asp Gly Gln | | | |
| 2485 | 2490 | 2495 | |
| ggg atc cgg tcc agg tgg ttg cgg gtt tgc cat gcg ttt cat tgc cat | | | 7536 |
| Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser His | | | |
| 2500 | 2505 | 2510 | |
| cgg atg gat ccg atg ctg gcg gag ttc acc gaa atc gcc cgg agc gtg | | | 7584 |
| Arg Met Asp Pro Met Leu Ala Glu Phe Thr Glu Ile Ala Arg Ser Val | | | |
| 2515 | 2520 | 2525 | |
| gac tac cgg tgc tca ggg ctg ccg atc gtg tgc acg ttg acg ggt gag | | | 7632 |
| Asp Tyr Arg Ser Ser Gly Leu Pro Ile Val Ser Thr Leu Thr Gly Glu | | | |
| 2530 | 2535 | 2540 | |
| ctc gat gag gtc ggc atg ccg gct acg ccg gag tat tgg gtg cgc cag | | | 7680 |
| Leu Asp Glu Val Gly Met Pro Ala Thr Pro Glu Tyr Trp Val Arg Gln | | | |
| 2545 | 2550 | 2555 | 2560 |
| gtg cga gaa ccc gtc cgc ttc gcc gac ggt gtt gct gcg ctc gcg gct | | | 7728 |
| Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Ala Ala Leu Ala Ala | | | |
| 2565 | 2570 | 2575 | |
| cac ggt gtg agc acc gtc gtc gag gtc ggt ccg gat ggg gtg ttg tgc | | | 7776 |
| His Gly Val Ser Thr Val Val Glu Val Gly Pro Asp Gly Val Leu Ser | | | |
| 2580 | 2585 | 2590 | |
| gcg ctg gtg cag gag tgc gcg gcc gga tcc gat cag ggc gga cgg gtg | | | 7824 |
| Ala Leu Val Gln Glu Cys Ala Ala Gly Ser Asp Gln Gly Gly Arg Val | | | |
| 2595 | 2600 | 2605 | |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| gcc gcg gtt ccg ctc atg cgc agc aat cgc gac gag gcg cac acg gtg Ala Ala Val Pro Leu Met Arg Ser Asn Arg Asp Glu Ala His Thr Val 2610 2615 2620 | 7872 |
| aca acg gca ttg gcg cag atc cat gtg cgt ggt gct gag gtg gac tgg Thr Thr Ala Leu Ala Gln Ile His Val Arg Gly Ala Glu Val Asp Trp 2625 2630 2635 2640 | 7920 |
| cgg tcg ttt ttc gcc ggt acc ggg gca aag cag gtc gag ctg ccc acg Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Val Glu Leu Pro Thr 2645 2650 2655 | 7968 |
| tat gcc ttc caa cga cag cgg tac tgg ctt gac tca cca tcc gaa ccg Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ser Pro Ser Glu Pro 2660 2665 2670 | 8016 |
| gtc ggg caa tcc gcc gat ccc gcg cgc cag tcg ggc ttc tgg gaa ctc Val Gly Gln Ser Ala Asp Pro Ala Arg Gln Ser Gly Phe Trp Glu Leu 2675 2680 2685 | 8064 |
| gtc gag cag gaa gat gtc agc gcg ctc agc gcc gct ctg cac att acc Val Glu Gln Glu Asp Val Ser Ala Leu Ser Ala Ala Leu His Ile Thr 2690 2695 2700 | 8112 |
| ggc gat cac gac gtg cag gcg tcc ctg gaa tcg gtg gtt ccg gtc ctc Gly Asp His Asp Val Gln Ala Ser Leu Glu Ser Val Val Pro Val Leu 2705 2710 2715 2720 | 8160 |
| tcc tcc tgg cat cgc cgg atc cgc aac gaa tcc ctg gtg cac cag tgg Ser Ser Trp His Arg Arg Ile Arg Asn Glu Ser Leu Val His Gln Trp 2725 2730 2735 | 8208 |
| cgg tac cgg att tcc tgg cat gag cgg gca gat ttg cca gac ccc tcg Arg Tyr Arg Ile Ser Trp His Glu Arg Ala Asp Leu Pro Asp Pro Ser 2740 2745 2750 | 8256 |
| ttg tcg ggg aca tgg ctc gtc gtc gtg ccg gag ggg tgg tcg gcg agt Leu Ser Gly Thr Trp Leu Val Val Pro Glu Gly Trp Ser Ala Ser 2755 2760 2765 | 8304 |
| cgg caa gtt ctg cgt ttc aac gag atg ttc gag gaa cgg ggt tgc ccg Arg Gln Val Leu Arg Phe Asn Glu Met Phe Glu Glu Arg Gly Cys Pro 2770 2775 2780 | 8352 |
| gca gtt ctg ttc gag ctc gcc ggg cac gac gag gaa gcc ctg gcg caa Ala Val Leu Phe Glu Leu Ala Gly His Asp Glu Glu Ala Leu Ala Gln 2785 2790 2795 2800 | 8400 |
| cga ttc cgc tcg ttg cct gtt gcg tca ggg gga ata agc ggc gtg ttg Arg Phe Arg Ser Leu Pro Val Ala Ser Gly Gly Ile Ser Gly Val Leu 2805 2810 2815 | 8448 |
| tcc ttg ctg gcg ctg gat gaa tcg ccg tcc tcg ccg aac gct gct ttg Ser Leu Leu Ala Leu Asp Glu Ser Pro Ser Ser Pro Asn Ala Ala Leu 2820 2825 2830 | 8496 |

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|---------------------------------------------------------------------|------|
| ccg aat ggc gcg ctg aac tcg ttg gta ctg ctg cga gct ctg cgg gcc | 8544 |
| Pro Asn Gly Ala Leu Asn Ser Leu Val Leu Leu Arg Ala Leu Arg Ala | |
| 2835 2840 2845 | |
| gcg gat gtg tcg gcg cca ttg tgg ttg gcg acg tgt ggt ggt gtc gcg | 8592 |
| Ala Asp Val Ser Ala Pro Leu Trp Leu Ala Thr Cys Gly Gly Val Ala | |
| 2850 2855 2860 | |
| gtc ggg gat gtg ccg gtg aac ccg ggg cag gcg ctg gtg tgg gga ctg | 8640 |
| Val Gly Asp Val Pro Val Asn Pro Gly Gln Ala Leu Val Trp Gly Leu | |
| 2865 2870 2875 2880 | |
| ggt cgc gtc gtc ggt ctg gag cat ccg gcc tgg tgg ggt ggc ctg gtc | 8688 |
| Gly Arg Val Val Gly Leu Glu His Pro Ala Trp Trp Gly Gly Leu Val | |
| 2885 2890 2895 | |
| gac gtg ccg tgc ttg ctc gat gag gac gct cga gaa cgc ttg tcg gtc | 8736 |
| Asp Val Pro Cys Leu Leu Asp Glu Asp Ala Arg Glu Arg Leu Ser Val | |
| 2900 2905 2910 | |
| gtg ttg gca ggt ctt ggc gag gac gag atc gcg gta cgt ccc ggt ggt | 8784 |
| Val Leu Ala Gly Leu Gly Glu Asp Glu Ile Ala Val Arg Pro Gly Gly | |
| 2915 2920 2925 | |
| gtg ttc gtg cgg cgg ttg gaa cgc gct ggt gcg gcg tcg ggt gcc ggg | 8832 |
| Val Phe Val Arg Arg Leu Glu Arg Ala Gly Ala Ala Ser Gly Ala Gly | |
| 2930 2935 2940 | |
| tcg gtg tgg cgt cct ccg ggg acg gtg ttg gtg acg ggt ggt acg ggc | 8880 |
| Ser Val Trp Arg Pro Arg Gly Thr Val Leu Val Thr Gly Gly Thr Gly | |
| 2945 2950 2955 2960 | |
| ggt ttg ggg gcg cat gtt gcc ccg tgg ttg gcg ggt gcc ggg gct gag | 8928 |
| Gly Leu Gly Ala His Val Ala Arg Trp Leu Ala Gly Ala Gly Ala Glu | |
| 2965 2970 2975 | |
| cat gtg gtg ttg acc agc cgt cga ggc gcg gcg gct ccg ggc gct gga | 8976 |
| His Val Val Leu Thr Ser Arg Arg Gly Ala Ala Ala Pro Gly Ala Gly | |
| 2980 2985 2990 | |
| gat ttg ccg gcg gcg gag ctg gag gcg ctg ggc gct ccg gtt tcg atc acg | 9024 |
| Asp Leu Arg Ala Glu Leu Glu Ala Leu Gly Ala Arg Val Ser Ile Thr | |
| 2995 3000 3005 | |
| gcc tgc gac gtg gcc gat cgt gac gct ttg gcc gaa gtg ttg gcg acc | 9072 |
| Ala Cys Asp Val Ala Asp Arg Asp Ala Leu Ala Glu Val Leu Ala Thr | |
| 3010 3015 3020 | |
| att ccg gat gat tgc ccg ctg acc gcg gtg atg cat gcg gcg ggg gtc | 9120 |
| Ile Pro Asp Asp Cys Pro Leu Thr Ala Val Met His Ala Ala Gly Val | |
| 3025 3030 3035 3040 | |
| gtt gaa gtc ggc gac gtg gcg tcg atg tgt ttg acc gac ttc gtt ggg | 9168 |
| Val Glu Val Gly Asp Val Ala Ser Met Cys Leu Thr Asp Phe Val Gly | |
| 3045 3050 3055 | |
| gtg ctg tcg gcg aag gca ggt ggt gcg gcg aat ctc gat gag ttg ctc | 9216 |

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|-----------------------------------------------------------------|------|
| Val Leu Ser Ala Lys Ala Gly Gly Ala Ala Asn Leu Asp Glu Leu Leu | |
| 3060 3065 3070 | |
| gcc gat gtc gag ctg gat gcc ttc gtg ctg ttc tca tcc gtc tcg ggt | 9264 |
| Ala Asp Val Glu Leu Asp Ala Phe Val Leu Phe Ser Ser Val Ser Gly | |
| 3075 3080 3085 | |
| gtg tgg ggt gct ggc ggg cag ggc gct tat gcg gcg gcg aat gcc tac | 9312 |
| Val Trp Gly Ala Gly Gly Gln Gly Ala Tyr Ala Ala Ala Asn Ala Tyr | |
| 3090 3095 3100 | |
| ttg gat gcg ttg gcg cag cag cgt cgg gca agg ggg ttg gtg ggg act | 9360 |
| Leu Asp Ala Leu Ala Gln Gln Arg Arg Ala Arg Gly Leu Val Gly Thr | |
| 3105 3110 3115 3120 | |
| gcg gtt gcg tgg ggc ccg tgg gcc ggt gac gga atg gcc gca ggt gaa | 9408 |
| Ala Val Ala Trp Gly Pro Trp Ala Gly Asp Gly Met Ala Ala Gly Glu | |
| 3125 3130 3135 | |
| ggc ggt gca cag ctg cgc cgg gcc ggc ctg gtg cca atg gct gcg gat | 9456 |
| Gly Gly Ala Gln Leu Arg Arg Ala Gly Leu Val Pro Met Ala Ala Asp | |
| 3140 3145 3150 | |
| cgg gcg ttg ctg gca ctt cag ggc gca ttg gat cgt gac gag aca tcc | 9504 |
| Arg Ala Leu Leu Ala Leu Gln Gly Ala Leu Asp Arg Asp Glu Thr Ser | |
| 3155 3160 3165 | |
| ctg gtc gtg gcc gat atg gcg tgg gag agg ttc gcc ccg gtg ttc gcc | 9552 |
| Leu Val Val Ala Asp Met Ala Trp Glu Arg Phe Ala Pro Val Phe Ala | |
| 3170 3175 3180 | |
| atg tcc cgt cgg cgt ccg ctg ctc gac gag ctg ccc gaa gca cag cag | 9600 |
| Met Ser Arg Arg Arg Pro Leu Leu Asp Glu Leu Pro Glu Ala Gln Gln | |
| 3185 3190 3195 3200 | |
| gcg ttg gcg gat gcg gag aac acc act gat gct gcg gac tcg gcc gtc | 9648 |
| Ala Leu Ala Asp Ala Glu Asn Thr Thr Asp Ala Ala Asp Ser Ala Val | |
| 3205 3210 3215 | |
| ccg cta ccg cgg ctc gcg ggc atg gca gcc gcc gaa cgc cgc cgc gcg | 9696 |
| Pro Leu Pro Arg Leu Ala Gly Met Ala Ala Ala Glu Arg Arg Arg Ala | |
| 3220 3225 3230 | |
| atg ctg gac ctg gtg ctg gcg gag gcc tcg att gtg ttg gga cac aac | 9744 |
| Met Leu Asp Leu Val Leu Ala Glu Ala Ser Ile Val Leu Gly His Asn | |
| 3235 3240 3245 | |
| ggg tct gac cca gtt ggt ccc gac cgg gcg ttc cag gag ctc gga ttt | 9792 |
| Gly Ser Asp Pro Val Gly Pro Asp Arg Ala Phe Gln Glu Leu Gly Phe | |
| 3250 3255 3260 | |
| gat tcg ctg atg gcc gtc gaa ctg cgc aac agg ttg ggc gag gca aca | 9840 |
| Asp Ser Leu Met Ala Val Glu Leu Arg Asn Arg Leu Gly Glu Ala Thr | |
| 3265 3270 3275 3280 | |
| gga ttg agt ctg ccg gcc acg ttg atc ttc gat tat ccg agc cca tcc | 9888 |
| Gly Leu Ser Leu Pro Ala Thr Leu Ile Phe Asp Tyr Pro Ser Pro Ser | |

| 3285 | 3290 | 3295 | |
|-----------------------------------------------------------------|------|------|-------|
| gcg ctg gct gag cag ctg gtc ggc gag ctg gtg gga gcg cag ccc gcg | | | 9936 |
| Ala Leu Ala Glu Gln Leu Val Gly Glu Leu Val Gly Ala Gln Pro Ala | | | |
| 3300 | 3305 | 3310 | |
| acc acc gtc gtg gcc ggg gcc gat cca gtg gat gat ccg gtt gtc gtg | | | 9984 |
| Thr Thr Val Val Ala Gly Ala Asp Pro Val Asp Asp Pro Val Val Val | | | |
| 3315 | 3320 | 3325 | |
| gtc gcg atg gga tgc cgg tat ccg ggc gac gtc tgc tcg ccc gag gag | | | 10032 |
| Val Ala Met Gly Cys Arg Tyr Pro Gly Asp Val Cys Ser Pro Glu Glu | | | |
| 3330 | 3335 | 3340 | |
| ctg tgg cag ctg gtt tct gcg gga cgt gat gcg gta tcg acg ttc ccc | | | 10080 |
| Leu Trp Gln Leu Val Ser Ala Gly Arg Asp Ala Val Ser Thr Phe Pro | | | |
| 3345 | 3350 | 3355 | 3360 |
| gtc gat ccg ggt tgg gac tgc aac acg ttg ttc gac ccg gat ccg gat | | | 10128 |
| Val Asp Arg Gly Trp Asp Cys Asn Thr Leu Phe Asp Pro Asp Pro Asp | | | |
| 3365 | 3370 | 3375 | |
| ccg gca ggc agt acc tat gtg cga gaa ggt gcc ttc ctg acc ggt gct | | | 10176 |
| Arg Ala Gly Ser Thr Tyr Val Arg Glu Gly Ala Phe Leu Thr Gly Ala | | | |
| 3380 | 3385 | 3390 | |
| gat ccg ttc gac gcc ggg ttc ttc ggc atc agc cct ccg gag gcg ccg | | | 10224 |
| Asp Arg Phe Asp Ala Gly Phe Phe Gly Ile Ser Pro Arg Glu Ala Arg | | | |
| 3395 | 3400 | 3405 | |
| gca atg gat ccg cag cag agg ttg ttg ctc gaa gtg gcg tgg gag gtt | | | 10272 |
| Ala Met Asp Pro Gln Gln Arg Leu Leu Leu Glu Val Ala Trp Glu Val | | | |
| 3410 | 3415 | 3420 | |
| ttc gaa cga gca gga atc gct ccg ctg tcg ttg ccg ggt agc agg acc | | | 10320 |
| Phe Glu Arg Ala Gly Ile Ala Pro Leu Ser Leu Arg Gly Ser Arg Thr | | | |
| 3425 | 3430 | 3435 | 3440 |
| ggg gtg ttc gcg ggg acc aat ggg cag gac cac ggt gcg aaa gtg gct | | | 10368 |
| Gly Val Phe Ala Gly Thr Asn Gly Gln Asp His Gly Ala Lys Val Ala | | | |
| 3445 | 3450 | 3455 | |
| gcc gcg ccg gag gcg gcg ggt cac ctc ctg acc gga aac gcc gcg agt | | | 10416 |
| Ala Ala Pro Glu Ala Ala Gly His Leu Leu Thr Gly Asn Ala Ala Ser | | | |
| 3460 | 3465 | 3470 | |
| gtc ctg gcc ggc cgg ctt tcc tac acg ttc ggc ctt gag ggg cct gcg | | | 10464 |
| Val Leu Ala Gly Arg Leu Ser Tyr Thr Phe Gly Leu Glu Gly Pro Ala | | | |
| 3475 | 3480 | 3485 | |
| gtg gcg gtg gat acc gcg tgt tcg tcg tcg ttg gtg gcg ttg cat ttg | | | 10512 |
| Val Ala Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu | | | |
| 3490 | 3495 | 3500 | |
| gcg tgc cag tcg ctg cgt tcg ggt gag tgt gat atg gcg ttg gca ggt | | | 10560 |
| Ala Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Met Ala Leu Ala Gly | | | |
| 3505 | 3510 | 3515 | 3520 |

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|-----------------------------------------------------------------|-------|
| ggt gtg acg gtg atg tcg aca ccc ctg gct ttc ctc gag ttc tct cgt | 10608 |
| Gly Val Thr Val Met Ser Thr Pro Leu Ala Phe Leu Glu Phe Ser Arg | |
| 3525 3530 3535 | |
| cag cgc ggt ttg gcg cca gat ggt cgg tgc aag tcg ttt gcg gcc gct | 10656 |
| Gln Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala | |
| 3540 3545 3550 | |
| gcg gat ggc acc ggg tgg ggt gag ggt gcc ggc ctg gtg ttg ctg gag | 10704 |
| Ala Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu | |
| 3555 3560 3565 | |
| cgg ttg tcg gat gct cgt cgg aat ggt cac cgg gtg ttg gcc gtg gtt | 10752 |
| Arg Leu Ser Asp Ala Arg Arg Asn Gly His Arg Val Leu Ala Val Val | |
| 3570 3575 3580 | |
| cgc ggg tct gcg gtg aat cag gat ggt gcg tcg aat ggc ctg act gcg | 10800 |
| Arg Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala | |
| 3585 3590 3595 3600 | |
| ccg aat ggt ccg tcg cag cag cgg gtg att cgg cag gcc ctc gcg aat | 10848 |
| Pro Asn Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn | |
| 3605 3610 3615 | |
| gcg ggg ctg tcg gcg tcc gat gtg gat gtc gtg gag gcg cac ggg acc | 10896 |
| Ala Gly Leu Ser Ala Ser Asp Val Asp Val Val Glu Ala His Gly Thr | |
| ' 3620 3625 3630 | |
| ggt acc ggg ctc ggg gat ccg atc gag gcg cag gcg ctg atc gcg aca | 10944 |
| Gly Thr Gly Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr | |
| 3635 3640 3645 | |
| tat ggg cag gag cgg gat cct gag cgg gcc ctg tgg ctg ggg tcg atc | 10992 |
| Tyr Gly Gln Glu Arg Asp Pro Glu Arg Ala Leu Trp Leu Gly Ser Ile | |
| 3650 3655 3660 | |
| aag tcc aac atc ggc cac acg cag gcg gcg gcc ggt gtg gcg ggg gtc | 11040 |
| Lys Ser Asn Ile Gly His Thr Gln Ala Ala Gly Val Ala Gly Val | |
| 3665 3670 3675 3680 | |
| atc aag atg gtg cag gcc atg cgg cac ggg gag ttg cct gcg acg ttg | 11088 |
| Ile Lys Met Val Gln Ala Met Arg His Gly Glu Leu Pro Ala Thr Leu | |
| 3685 3690 3695 | |
| cac gtg gac aag ccc act cca cag gtg gac tgg tct gcc ggg gcc gtt | 11136 |
| His Val Asp Lys Pro Thr Pro Gln Val Asp Trp Ser Ala Gly Ala Val | |
| 3700 3705 3710 | |
| cgg ctc ctc acc ggg aac acg ccc tgg ccc gag agc ggc cgt cct cgt | 11184 |
| Arg Leu Leu Thr Gly Asn Thr Pro Trp Pro Glu Ser Gly Arg Pro Arg | |
| 3715 3720 3725 | |
| cga gcg ggg gtg tcg tcg ttc ggg atc agc ggc acc aac gca cac ctc | 11232 |
| Arg Ala Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Leu | |
| 3730 3735 3740 | |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| atc ctc gaa caa cca ccg tcg gaa cca gcg gag atc gac caa tcg gat Ile Leu Glu Gln Pro Pro Ser Glu Pro Ala Glu Ile Asp Gln Ser Asp 3745 3750 3755 3760 | 11280 |
| cgg cgg gtc act gcg cat cca gcg gtg atc ccg tgg atg ttg tcg gct Arg Arg Val Thr Ala His Pro Ala Val Ile Pro Trp Met Leu Ser Ala 3765 3770 3775 | 11328 |
| agg agt ctc gca gcg ctg cag gcc caa gcg gct gcg ctg cag gcc cgg Arg Ser Leu Ala Ala Leu Gln Ala Gln Ala Ala Ala Leu Gln Ala Arg 3780 3785 3790 | 11376 |
| ctg gac cgg ggt cct ggc gct tct ccg ctg gat ttg ggg tat tca ctc Leu Asp Arg Gly Pro Gly Ala Ser Pro Leu Asp Leu Gly Tyr Ser Leu 3795 3800 3805 | 11424 |
| gcg acc act cgt tct gtg ctg gac gaa cgc gcc gtc gtg tgg ggt gcc Ala Thr Thr Arg Ser Val Leu Asp Glu Arg Ala Val Val Trp Gly Ala 3810 3815 3820 | 11472 |
| gat cgg gag gca ctg ctg tcc agg ctg gca gcg ctc gcc gat ggc cgg Asp Arg Glu Ala Leu Leu Ser Arg Leu Ala Ala Leu Ala Asp Gly Arg 3825 3830 3835 3840 | 11520 |
| acg gcg ccg ggg gtg ata acg ggc tct gcg aat tcc ggt ggc cgc atc Thr Ala Pro Gly Val Ile Thr Gly Ser Ala Asn Ser Gly Gly Arg Ile 3845 3850 3855 | 11568 |
| gga ttc gtt ttt tcc ggt cag ggc agt cag tgg ctg ggg atg gga aag Gly Phe Val Phe Ser Gly Gln Gly Ser Gln Trp Leu Gly Met Gly Lys 3860 3865 3870 | 11616 |
| gcg ttg tgc gcg gct ttc ccg gcg ttc gcg gac gcc ttc gag gaa gcc Ala Leu Cys Ala Ala Phe Pro Ala Phe Ala Asp Ala Phe Glu Glu Ala 3875 3880 3885 | 11664 |
| tgc gac gcg cta agc gca cac ctg ggc gcg gac gtt cgg ggt gtg ctg Cys Asp Ala Leu Ser Ala His Leu Gly Ala Asp Val Arg Gly Val Leu 3890 3895 3900 | 11712 |
| ttc ggt gct gat gag cag atg ctc gac cgg acg ctg tgg gcg cag tcg Phe Gly Ala Asp Glu Gln Met Leu Asp Arg Thr Leu Trp Ala Gln Ser 3905 3910 3915 3920 | 11760 |
| ggg atc ttc gcg gtt caa gtc ggc ctc ctg gga ttg ctg agg tcg tgg Gly Ile Phe Ala Val Gln Val Gly Leu Leu Gly Leu Leu Arg Ser Trp 3925 3930 3935 | 11808 |
| ggc gtg cgg ccg gcc gcg gtg ctg ggg cac tcg gtc ggc gag ttg gct Gly Val Arg Pro Ala Ala Val Leu Gly His Ser Val Gly Glu Leu Ala 3940 3945 3950 | 11856 |
| gcg gcg cac gcg gct ggt gtg ttg tcc ttg ccg gac gct gca cgg ttg Ala Ala His Ala Ala Gly Val Leu Ser Leu Pro Asp Ala Ala Arg Leu 3955 3960 3965 | 11904 |
| gtt gcg gct cgg gcc cac ctg atg cag gca ttg ccc acc ggc ggc gca | 11952 |

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|-----------------------------------------------------------------|-------|
| Val Ala Ala Arg Ala His Leu Met Gln Ala Leu Pro Thr Gly Gly Ala | |
| 3970 3975 3980 | |
| atg ctc gcg gtc gcc acc agc gag gcg gcg gtc gga ccg ctg ctt tcc | 12000 |
| Met Leu Ala Val Ala Thr Ser Glu Ala Ala Val Gly Pro Leu Leu Ser | |
| 3985 3990 3995 4000 | |
| ggg gtg tgc gat cgg gtc agc atc gct gcg atc aac ggc ccc gag tgc | 12048 |
| Gly Val Cys Asp Arg Val Ser Ile Ala Ala Ile Asn Gly Pro Glu Ser | |
| 4005 4010 4015 | |
| gta gtg ctc tcc ggc gac cgc gat gtg ctc gtg gag ctc gca ggc gaa | 12096 |
| Val Val Leu Ser Gly Asp Arg Asp Val Leu Val Glu Leu Ala Gly Glu | |
| 4020 4025 4030 | |
| ttc gat gcc cga ggg ctt agg acc aaa tgg ttg cgg gtc tcc cat gct | 12144 |
| Phe Asp Ala Arg Gly Leu Arg Thr Lys Trp Leu Arg Val Ser His Ala | |
| 4035 4040 4045 | |
| ttc cac tcg cac cgg atg gaa ccg att ctg gac gag tac gcg gaa acc | 12192 |
| Phe His Ser His Arg Met Glu Pro Ile Leu Asp Glu Tyr Ala Glu Thr | |
| 4050 4055 4060 | |
| gcc agg tgc gtc gag ttc ggt gaa ccg gtg gtg ccg atc gtc tcc gcc | 12240 |
| Ala Arg Cys Val Glu Phe Gly Glu Pro Val Val Pro Ile Val Ser Ala | |
| 4065 4070 4075 4080 | |
| gcg acc ggt gcg ctg gac acc acc gga ctg atg tgc gcg gcc gac tac | 12288 |
| Ala Thr Gly Ala Leu Asp Thr Thr Gly Leu Met Cys Ala Ala Asp Tyr | |
| 4085 4090 4095 | |
| tgg acg cgc caa gtg cgt gat cct gtc cgc ttc gga gac ggt gtc cgg | 12336 |
| Trp Thr Arg Gln Val Arg Asp Pro Val Arg Phe Gly Asp Gly Val Arg | |
| 4100 4105 4110 | |
| gcg ctc gtc ggc caa ggc gtg gac acg atc gtc gag ttc ggc ccg gac | 12384 |
| Ala Leu Val Gly Gln Gly Val Asp Thr Ile Val Glu Phe Gly Pro Asp | |
| 4115 4120 4125 | |
| ggg gcg ttg tcg gcc ctg gtc gag cag tgc ttg gcc ggg tcc gac cag | 12432 |
| Gly Ala Leu Ser Ala Leu Val Glu Gln Cys Leu Ala Gly Ser Asp Gln | |
| 4130 4135 4140 | |
| gct ggg agg gtg gcg gcg atc ccg ctg atg cgc agg gac cgc gat gag | 12480 |
| Ala Gly Arg Val Ala Ala Ile Pro Leu Met Arg Arg Asp Arg Asp Glu | |
| 4145 4150 4155 4160 | |
| gtc gag acc gcg gtg gcg gcc ctg gcg cac gtg cac gtc cgc ggt ggt | 12528 |
| Val Glu Thr Ala Val Ala Ala Leu Ala His Val His Val Arg Gly Gly | |
| 4165 4170 4175 | |
| gcg gtg gac tgg tcg gct tgc ttc gcc ggc acc ggc gcc cgc acc gtc | 12576 |
| Ala Val Asp Trp Ser Ala Cys Phe Ala Gly Thr Gly Ala Arg Thr Val | |
| 4180 4185 4190 | |
| gag ttg ccc acc tac gcc ttc caa cgc cag cgg tac tgg ctg gcc ggg | 12624 |
| Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Ala Gly | |

| 4195 | 4200 | 4205 | |
|-----------------------------------------------------------------|------|------|-------|
| caa gcg gac ggg cgc ggc ggc gat gtg gtt gcc gac ccg gtc gac gcg | | | 12672 |
| Gln Ala Asp Gly Arg Gly Gly Asp Val Val Ala Asp Pro Val Asp Ala | | | |
| 4210 | 4215 | 4220 | |
| cgc ttc tgg gag ttg gtc gag cgc gcc gat ccg gaa ccg ttg gtg gat | | | 12720 |
| Arg Phe Trp Glu Leu Val Glu Arg Ala Asp Pro Glu Pro Leu Val Asp | | | |
| 4225 | 4230 | 4235 | 4240 |
| gaa ctc tgc atc gac cgg gac cag ccc ttc ccg gag gtg ctg ccc gtt | | | 12768 |
| Glu Leu Cys Ile Asp Arg Asp Gln Pro Phe Arg Glu Val Leu Pro Val | | | |
| 4245 | 4250 | 4255 | |
| ctg gct tcc tgg cgc gag aaa caa cgc cag gag gcc ctc gcg gat tcc | | | 12816 |
| Leu Ala Ser Trp Arg Glu Lys Gln Arg Gln Glu Ala Leu Ala Asp Ser | | | |
| 4260 | 4265 | 4270 | |
| tgg cgc tac cag gtg cgc tgg agg tcc gtc gag gtg ccg tcc gca gcc | | | 12864 |
| Trp Arg Tyr Gln Val Arg Trp Arg Ser Val Glu Val Pro Ser Ala Ala | | | |
| 4275 | 4280 | 4285 | |
| gcc ctc ccg ggc gtg tgg ctg gtg gtg ctt cca gct gac gtg ccc cga | | | 12912 |
| Ala Leu Arg Gly Val Trp Leu Val Val Leu Pro Ala Asp Val Pro Arg | | | |
| 4290 | 4295 | 4300 | |
| gat caa ccg gcg gtc gtc atc gac gcg ctg atc gcg cgc ggc gcc gag | | | 12960 |
| Asp Gln Pro Ala Val Val Ile Asp Ala Leu Ile Ala Arg Gly Ala Glu | | | |
| 4305 | 4310 | 4315 | 4320 |
| gtc gcg gtc ctg gaa ttg acc gag cag gac ctc caa cgc agt gcg ctt | | | 13008 |
| Val Ala Val Leu Glu Leu Thr Glu Gln Asp Leu Gln Arg Ser Ala Leu | | | |
| 4325 | 4330 | 4335 | |
| gtg gac aag gtg cgc gcc gtc att gcg gac cgc acc gag gtg acg ggt | | | 13056 |
| Val Asp Lys Val Arg Ala Val Ile Ala Asp Arg Thr Glu Val Thr Gly | | | |
| 4340 | 4345 | 4350 | |
| gtg ttg tct ctg ttg gcg atg gac ggc atg ccc tgc gcg gcg cat ccg | | | 13104 |
| Val Leu Ser Leu Leu Ala Met Asp Gly Met Pro Cys Ala Ala His Pro | | | |
| 4355 | 4360 | 4365 | |
| cac ctg tcc cgt ggt gtc gcc gct acc gtg atc ctg acg cag gtg ttg | | | 13152 |
| His Leu Ser Arg Gly Val Ala Ala Thr Val Ile Leu Thr Gln Val Leu | | | |
| 4370 | 4375 | 4380 | |
| ggc gat gcg ggt gtt tcc gcc ccg ctg tgg ctg gcc acg acc ggt ggc | | | 13200 |
| Gly Asp Ala Gly Val Ser Ala Pro Leu Trp Leu Ala Thr Thr Gly Gly | | | |
| 4385 | 4390 | 4395 | 4400 |
| gtc gag gcc ggg acc gag gac ggt ccg gcc gat ccg gac cac ggc ttg | | | 13248 |
| Val Glu Ala Gly Thr Glu Asp Gly Pro Ala Asp Pro Asp His Gly Leu | | | |
| 4405 | 4410 | 4415 | |
| atc tgg ggg ctc ggc agg gtc gtc ggc ctt gaa cat ccg cag tgg tgg | | | 13296 |
| Ile Trp Gly Leu Gly Arg Val Val Gly Leu Glu His Pro Gln Trp Trp | | | |
| 4420 | 4425 | 4430 | |

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|-----------------------------------------------------------------|-------|
| ggt ggc ctg atc gac ctt ccg gag aca ctg gac gag acg tcc cgg aac | 13344 |
| Gly Gly Leu Ile Asp Leu Pro Glu Thr Leu Asp Glu Thr Ser Arg Asn | |
| 4435 4440 4445 | |
| ggg ttg gtg gcc gca ctc gcc ggg acg gcg gcc gaa gat cag ctc gcc | 13392 |
| Gly Leu Val Ala Ala Leu Ala Gly Thr Ala Ala Glu Asp Gln Leu Ala | |
| 4450 4455 4460 | |
| gtg cgt tca tcc ggg ttg ttc gtt cgc aga gtg gtg cgc gca gcg cgg | 13440 |
| Val Arg Ser Ser Gly Leu Phe Val Arg Arg Val Val Arg Ala Ala Arg | |
| 4465 4470 4475 4480 | |
| aac ccc cgg tca gag aca tgg cgt agc cgg gga acg gtc ctc atc acg | 13488 |
| Asn Pro Arg Ser Glu Thr Trp Arg Ser Arg Gly Thr Val Leu Ile Thr | |
| 4485 4490 4495 | |
| ggc gga aca ggc gcg ctc ggt gcc gag gtc gca cga tgg ctg gcc cgg | 13536 |
| Gly Gly Thr Gly Ala Leu Gly Ala Glu Val Ala Arg Trp Leu Ala Arg | |
| 4500 4505 4510 | |
| cgg gga gct gag cac ctg gtg ttg atc agt cgc cgc ggc ccg gaa gct | 13584 |
| Arg Gly Ala Glu His Leu Val Leu Ile Ser Arg Arg Gly Pro Glu Ala | |
| 4515 4520 4525 | |
| ccc ggc gca gcg gac cta ggg gcc gag ctg act gaa ctc ggc gtg aaa | 13632 |
| Pro Gly Ala Ala Asp Leu Gly Ala Glu Leu Thr Glu Leu Gly Val Lys | |
| 4530 4535 4540 | |
| gtc aca gtc ttg gcc tgc gat gtg acg gac cgc gac gag ctg gcg gcg | 13680 |
| Val Thr Val Leu Ala Cys Asp Val Thr Asp Arg Asp Glu Leu Ala Ala | |
| 4545 4550 4555 4560 | |
| gtg ctg gcg gcc gtt ccc acg gag tat ccg ctg tcg gcg gtc gtg cac | 13728 |
| Val Leu Ala Ala Val Pro Thr Glu Tyr Pro Leu Ser Ala Val Val His | |
| 4565 4570 4575 | |
| acc gcc ggc gtc ggg acg cct gcg aac ctg gcc gag acg acc ttg gcg | 13776 |
| Thr Ala Gly Val Gly Thr Pro Ala Asn Leu Ala Glu Thr Thr Leu Ala | |
| 4580 4585 4590 | |
| cag ttc gcc gac gtg ttg tcg gcc aag gtc gtc ggc gcg gcg aac ctg | 13824 |
| Gln Phe Ala Asp Val Leu Ser Ala Lys Val Val Gly Ala Ala Asn Leu | |
| 4595 4600 4605 | |
| gac cgg ctg ctt ggc ggg caa ccg ttg gac gcc ttc gtg ctg ttc tcc | 13872 |
| Asp Arg Leu Leu Gly Gly Gln Pro Leu Asp Ala Phe Val Leu Phe Ser | |
| 4610 4615 4620 | |
| tcg atc tcg gga gtt tgg gga gcc ggc ggc caa gga gcc tat tcg gcc | 13920 |
| Ser Ile Ser Gly Val Trp Gly Ala Gly Gly Gln Gly Ala Tyr Ser Ala | |
| 4625 4630 4635 4640 | |
| gcc aat gcg tat ctc gat gcc ctt gcc gag cgc cga cgg gct tgc ggg | 13968 |
| Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Arg Arg Arg Ala Cys Gly | |
| 4645 4650 4655 | |

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| cgg ccg gcg acg tgc atc gcc tgg ggt ccg tgg gcg ggt gcg ggc atg Arg Pro Ala Thr Cys Ile Ala Trp Gly Pro Trp Ala Gly Ala Gly Met 4660 4665 4670 | 14016 |
| gcc gtt cag gaa ggt aac gag gcg cat ctc cgc cga agg ggc ctg gta Ala Val Gln Glu Gly Asn Glu Ala His Leu Arg Arg Arg Gly Leu Val 4675 4680 4685 | 14064 |
| ccg atg gaa ccg cag tcg gcc ctc ttc gcg ctg caa cag gcc ctg tcc Pro Met Glu Pro Gln Ser Ala Leu Phe Ala Leu Gln Gln Ala Leu Ser 4690 4695 4700 | 14112 |
| caa cga gaa acc gcc atc acc gtc gca gat gtg gac tgg gag cga ttc Gln Arg Glu Thr Ala Ile Thr Val Ala Asp Val Asp Trp Glu Arg Phe 4705 4710 4715 4720 | 14160 |
| gcc gcc tct ttc acc gcg gcc cgc ccg cga cca ctg ttg gaa gag atc Ala Ala Ser Phe Thr Ala Ala Arg Pro Arg Pro Leu Leu Glu Glu Ile 4725 4730 4735 | 14208 |
| gtg gat cta cgg ccc gac acc gag acc gag gag aag cac ggt gcc ggc Val Asp Leu Arg Pro Asp Thr Glu Thr Glu Glu Lys His Gly Ala Gly 4740 4745 4750 | 14256 |
| gag ctg ggg cag cag ctg gcc gca ctg ccg ccc gct gag cgc gga cac Glu Leu Gly Gln Gln Leu Ala Ala Leu Pro Pro Ala Glu Arg Gly His 4755 4760 4765 | 14304 |
| ctg ctg ctg gag gtg gtg ctg gcg gaa acc gcc agc acc ctg ggg cac Leu Leu Leu Glu Val Val Leu Ala Glu Thr Ala Ser Thr Leu Gly His 4770 4775 4780 | 14352 |
| gat tcg gcg gag gct gtg caa ccc gat cgg acc ttc gcc gaa ctg ggc Asp Ser Ala Glu Ala Val Gln Pro Asp Arg Thr Phe Ala Glu Leu Gly 4785 4790 4795 4800 | 14400 |
| ttc gat tcg ctg acc gcg gta gag ctg cgc aac agg ttg aac gcg gtg Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn Ala Val 4805 4810 4815 | 14448 |
| acc ggg ctt cgc ctg ccg ccg acg ctg gtt ttc gac cac ccg acg ccg Thr Gly Leu Arg Leu Pro Pro Thr Leu Val Phe Asp His Pro Thr Pro 4820 4825 4830 | 14496 |
| ctg gcg ttg tcc gaa cag ttg gtt ccg gcc ctg gtc gcg gag ccg gac Leu Ala Leu Ser Glu Gln Leu Val Pro Ala Leu Val Ala Glu Pro Asp 4835 4840 4845 | 14544 |
| aac ggc atc gaa tcg ctg ctc gcc gag ctc gac agg ctg gat acc acg Asn Gly Ile Glu Ser Leu Leu Ala Glu Leu Asp Arg Leu Asp Thr Thr 4850 4855 4860 | 14592 |
| ttg gcg caa ggg cct tcg atc cca ctg gaa gac cag gcc aag gtg gcg Leu Ala Gln Gly Pro Ser Ile Pro Leu Glu Asp Gln Ala Lys Val Ala 4865 4870 4875 4880 | 14640 |
| gag cgc ttg cac gca ctc ctc gcc aag tgg gac ggg gcg cgt gac ggc | 14688 |

Glu Arg Leu His Ala Leu Leu Ala Lys Trp Asp Gly Ala Arg Asp Gly
4885 4890 4895

acg gcc aga gcg acg tca ccc caa tcg ctg acg gcg gcc acg gac gac 14736
Thr Ala Arg Ala Thr Ser Pro Gln Ser Leu Thr Ala Ala Thr Asp Asp
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Glu Ile Phe Asp Leu Ile Asp Arg Lys Phe Arg Arg
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<212> PRT
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<400> 48
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1 5 10 15

Asp Leu His Gln Thr Arg Gln Arg Leu Leu Ala Ala Glu Ser Arg Ser
20 25 30

Gln Glu Pro Ile Ala Ile Val Ser Ala Ser Cys Arg Leu Pro Gly Gly
35 40 45

Val Asp Ser Pro Glu Ala Leu Trp Gln Leu Val Arg Thr Gly Thr Asp
50 55 60

Ala Ile Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp Leu Gly Arg Leu
65 70 75 80

Tyr Asp Pro Asp Pro Asn His Gln Gly Thr Ser Tyr Thr Arg Ala Gly
85 90 95

Gly Phe Leu Ala Gly Ala Gly Asp Phe Asp Pro Ala Met Phe Gly Ile
100 105 110

Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
115 120 125

Glu Leu Ser Trp Glu Ala Leu Glu Arg Ala Gly Ile Asp Pro Thr Ser
130 135 140

Leu Arg Gly Ser Lys Thr Gly Val Phe Gly Gly Val Thr Pro Gln Glu
145 150 155 160

Tyr Gly Pro Ser Leu Gln Glu Met Ser Arg Asn Ala Gly Gly Phe Gly
165 170 175

Leu Thr Gly Arg Met Val Ser Val Ala Ser Gly Arg Val Ala Tyr Ser
180 185 190

Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser
195 200 205

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Leu | Val | Ala | Leu | His | Leu | Ala | Cys | Gln | Ser | Leu | Arg | Ser | Gly | Glu | 210 | 215 | 220 | |
| Cys | Asp | Leu | Ala | Leu | Ala | Gly | Gly | Val | Thr | Val | Met | Ala | Thr | Pro | Ala | 225 | 230 | 235 | 240 |
| Thr | Phe | Val | Glu | Phe | Ser | Arg | Gln | Arg | Gly | Leu | Ala | Pro | Asp | Gly | Arg | 245 | 250 | 255 | |
| Cys | Lys | Ser | Phe | Ala | Ala | Ala | Ala | Asp | Gly | Thr | Gly | Trp | Gly | Glu | Gly | 260 | 265 | 270 | |
| Ala | Gly | Leu | Val | Leu | Leu | Glu | Arg | Leu | Ser | Asp | Ala | Arg | Arg | Asn | Gly | 275 | 280 | 285 | |
| His | Glu | Val | Leu | Ala | Val | Val | Arg | Gly | Ser | Ala | Val | Asn | Gln | Asp | Gly | 290 | 295 | 300 | |
| Ala | Ser | Asn | Gly | Leu | Thr | Ala | Pro | Asn | Gly | Pro | Ser | Gln | Gln | Arg | Val | 305 | 310 | 315 | 320 |
| Ile | Thr | Gln | Ala | Leu | Ala | Ser | Ala | Gly | Leu | Ser | Val | Ser | Asp | Val | Asp | 325 | 330 | 335 | |
| Ala | Val | Glu | Ala | His | Gly | Thr | Gly | Thr | Thr | Leu | Gly | Asp | Pro | Ile | Glu | 340 | 345 | 350 | |
| Ala | Gln | Ala | Leu | Ile | Ala | Thr | Tyr | Gly | Gln | Gly | Arg | Glu | Lys | Asp | Arg | 355 | 360 | 365 | |
| Pro | Leu | Trp | Leu | Gly | Ser | Val | Lys | Ser | Asn | Ile | Gly | His | Thr | Gln | Ala | 370 | 375 | 380 | |
| Ala | Ala | Gly | Val | Ala | Gly | Val | Ile | Lys | Met | Val | Leu | Ala | Met | Arg | His | 385 | 390 | 395 | 400 |
| Gly | Gln | Leu | Pro | Ala | Thr | Leu | His | Val | Asp | Glu | Pro | Thr | Ser | Ala | Val | 405 | 410 | 415 | |
| Asp | Trp | Ser | Ala | Gly | Ser | Val | Arg | Leu | Leu | Thr | Glu | Asn | Thr | Pro | Trp | 420 | 425 | 430 | |
| Pro | Asp | Ser | Gly | Arg | Pro | Cys | Arg | Val | Gly | Val | Ser | Ser | Phe | Gly | Ile | 435 | 440 | 445 | |
| Ser | Gly | Thr | Asn | Ala | His | Val | Ile | Leu | Glu | Gln | Ser | Pro | Val | Glu | Gln | 450 | 455 | 460 | |
| Gly | Glu | Pro | Ala | Gly | Pro | Val | Glu | Gly | Glu | Arg | Glu | Pro | Asp | Val | Ala | 465 | 470 | 475 | 480 |
| Val | Pro | Val | Val | Pro | Trp | Val | Leu | Ser | Gly | Lys | Thr | Pro | Glu | Ala | Ala | 485 | 490 | 495 | |
| Arg | Ala | Gln | Ala | Glu | Arg | Val | His | Ser | His | Ile | Glu | Asp | Arg | Pro | Gly | 500 | 505 | 510 | |

| | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Leu | Ser | Pro | Val | Asp | Val | Ala | Tyr | Ser | Leu | Gly | Met | Thr | Arg | Ala | Ala | | |
| | | 515 | | | | | 520 | | | | | 525 | | | | | |
| Leu | Asp | Glu | Arg | Ala | Val | Val | Leu | Gly | Ser | Asp | Arg | Ala | Ala | Leu | Leu | | |
| | 530 | | | | | 535 | | | | 540 | | | | | | | |
| Thr | Gly | Leu | Arg | Ala | Phe | Ala | Asp | Gly | Cys | Asp | Ala | Pro | Glu | Val | Val | | |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 | | |
| Ser | Gly | Ser | Val | Gly | Leu | Gly | Gly | Arg | Val | Gly | Phe | Val | Phe | Ser | Gly | | |
| | | | | 565 | | | | | 570 | | | | | 575 | | | |
| Gln | Gly | Gly | Gln | Trp | Pro | Gly | Met | Gly | Arg | Gly | Leu | Tyr | Ser | Val | Phe | | |
| | | | 580 | | | | | 585 | | | | | 590 | | | | |
| Pro | Val | Phe | Ala | Asp | Ala | Phe | Asp | Glu | Ala | Cys | Ala | Glu | Leu | Asp | Ala | | |
| | | 595 | | | | | 600 | | | | | 605 | | | | | |
| His | Leu | Gly | Gln | Glu | Leu | Arg | Val | Arg | Asp | Val | Val | Phe | Gly | Ser | Gln | | |
| | 610 | | | | | 615 | | | | | 620 | | | | | | |
| Ala | Trp | Leu | Leu | Asp | Arg | Thr | Val | Trp | Ala | Gln | Ser | Gly | Leu | Phe | Ala | | |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 | | |
| Leu | Gln | Ile | Gly | Leu | Leu | Arg | Leu | Leu | Gly | Ser | Trp | Gly | Val | Arg | Pro | | |
| | | | | 645 | | | | | 650 | | | | | 655 | | | |
| Asp | Val | Val | Leu | Gly | His | Ser | Val | Gly | Glu | Leu | Ala | Ala | Val | His | Ala | | |
| | | | 660 | | | | | 665 | | | | | 670 | | | | |
| Ala | Gly | Val | Leu | Ser | Leu | Ser | Glu | Ala | Ala | Arg | Leu | Val | Ala | Gly | Arg | | |
| | | 675 | | | | | 680 | | | | | 685 | | | | | |
| Ala | Arg | Leu | Met | Gln | Ala | Leu | Pro | Ser | Gly | Gly | Ala | Met | Leu | Ala | Val | | |
| | 690 | | | | | 695 | | | | | 700 | | | | | | |
| Ala | Thr | Gly | Glu | Phe | Gln | Val | Asp | Pro | Leu | Leu | Asp | Gly | Val | Arg | Asp | | |
| 705 | | | | | 710 | | | | | 715 | | | | 720 | | | |
| Arg | Ile | Gly | Ile | Ala | Ala | Val | Asn | Gly | Pro | Glu | Ser | Val | Val | Leu | Ser | | |
| | | | | 725 | | | | | 730 | | | | | 735 | | | |
| Gly | Asp | Arg | Glu | Leu | Leu | Thr | Glu | Ile | Ala | Asp | Arg | Leu | His | Asp | Gln | | |
| | | | 740 | | | | | 745 | | | | | 750 | | | | |
| Gly | Cys | Arg | Thr | Arg | Trp | Leu | Arg | Val | Ser | His | Ala | Phe | His | Ser | Pro | | |
| | | 755 | | | | | 760 | | | | | 765 | | | | | |
| His | Met | Glu | Pro | Met | Leu | Glu | Glu | Phe | Ala | Gln | Ile | Ser | Arg | Gly | Arg | | |
| | 770 | | | | | 775 | | | | | 780 | | | | | | |
| Glu | Tyr | His | Ala | Pro | Glu | Leu | Pro | Ile | Ile | Ser | Thr | Leu | Ile | Gly | Glu | | |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 | | |
| Leu | Asp | Gly | Gly | Arg | Val | Met | Gly | Thr | Pro | Glu | Tyr | Trp | Val | Arg | Gln | | |
| | | | | 805 | | | | | 810 | | | | | 815 | | | |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Val Arg Glu Pro Val Arg Phe Ala Glu Gly Val Gln Ala Leu Val Gly | 820 | 825 | 830 |
| Gln Gly Val Gly Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu Ser | 835 | 840 | 845 |
| Thr Leu Val Glu Glu Cys Val Ala Glu Ser Gly Arg Val Ala Gly Ile | 850 | 855 | 860 |
| Pro Leu Met Arg Lys Asp Arg Asp Glu Ala Arg Thr Val Leu Ala Ala | 865 | 870 | 875 |
| Leu Ala Gln Ile His Thr Arg Gly Gly Glu Val Asp Trp Arg Ser Phe | 885 | 890 | 895 |
| Phe Ala Gly Thr Gly Ala Lys Gln Val Asp Leu Pro Thr Tyr Ala Phe | 900 | 905 | 910 |
| Gln Arg Gln Arg Tyr Trp Leu Ala Ser Thr Gly Arg Ala Gly Asp Val | 915 | 920 | 925 |
| Thr Ala Ala Gly Leu Ala Glu Ala Asp His Pro Leu Leu Gly Ala Val | 930 | 935 | 940 |
| Val Ala Leu Ala Asp Gly Glu Gly Val Val Leu Thr Gly Arg Leu Thr | 945 | 950 | 955 |
| Ala Gly Ser His Pro Trp Leu Ser Asp His Arg Val Leu Gly Glu Ile | 965 | 970 | 975 |
| Val Val Pro Gly Thr Ala Ile Val Glu Leu Val Trp His Val Gly Glu | 980 | 985 | 990 |
| Arg Leu Gly Cys Gly Arg Val Glu Glu Leu Ala Leu Glu Ala Pro Leu | 995 | 1000 | 1005 |
| Ile Leu Pro Asp His Gly Ala Val Gln Val Gln Val Leu Val Gly Pro | 1010 | 1015 | 1020 |
| Pro Gly Glu Ser Gly Ala Arg Ser Val Ala Leu Tyr Ser Cys Pro Gly | 1025 | 1030 | 1035 |
| Glu Ala Ile Glu Pro Glu Trp Lys Lys His Ala Thr Gly Val Leu Leu | 1045 | 1050 | 1055 |
| Pro Pro Val Ala Ala Glu Asn His Glu Leu Thr Ala Trp Pro Pro Glu | 1060 | 1065 | 1070 |
| Asn Ala Thr Glu Ile Asp Ala Asp Gly Val Tyr Ala Phe Leu Glu Gly | 1075 | 1080 | 1085 |
| His Gly Phe Ala Tyr Gly Pro Ala Phe Arg Cys Leu Arg Gly Ala Trp | 1090 | 1095 | 1100 |
| Arg Arg Gly Gly Glu Val Phe Ala Glu Val Ala Leu Pro Asp Asp Met | 1105 | 1110 | 1115 |
| | | | 1120 |

Gln Ala Gly Val Asp Arg Phe Gly Val His Pro Ala Leu Leu Asp Ala
 1125 1130 1135
 Val Leu His Ala Ala Ala Glu Thr Ser Val Val Gln Ser Glu Ala
 1140 1145 1150
 Arg Val Pro Phe Ser Trp Arg Gly Val Glu Leu Arg Ala Thr Glu Ser
 1155 1160 1165
 Ala Val Val Arg Ala Arg Leu Ser Leu Thr Ser Asp Asp Glu Leu Ser
 1170 1175 1180
 Leu Val Ala Val Asp Pro Ala Gly Arg Phe Val Ala Thr Val Asp Ser
 1185 1190 1195 1200
 Leu Val Thr Arg Pro Ile Ser Arg Gln Gln Val Arg Ser Gly Ala Ile
 1205 1210 1215
 Gly Asp Cys Leu Phe Glu Val Glu Trp His Arg Lys Ala Leu Leu Gly
 1220 1225 1230
 Thr Thr Ala Gly Asp Asp Leu Ala Ile Val Gly Asp Gly Pro Ser Trp
 1235 1240 1245
 Pro Glu Ser Val Arg Ala Thr Ala Arg Phe Ala Thr Leu Asp Glu Phe
 1250 1255 1260
 Arg Ala Ala Val Asp Ser Asp Val Pro Ala Pro Gly Ser Val Leu Val
 1265 1270 1275 1280
 Ala Ala Met Ser Ala Glu Glu Val Glu Gly Gly Ser Leu Pro Ser Arg
 1285 1290 1295
 Ala Gln Glu Ser Thr Ser Asp Leu Leu Ala Leu Val Gln Ser Trp Leu
 1300 1305 1310
 Ala Asp Glu Arg Phe Ala Glu Ser Gln Leu Val Val Val Thr Arg Ala
 1315 1320 1325
 Ala Val Ser Ala Asp Ser Asp Ser Asp Val Ala Asp Leu Val Gly Ala
 1330 1335 1340
 Ser Ser Trp Gly Leu Leu Ser Ser Ala Gln Ser Glu Asn Pro Gly Arg
 1345 1350 1355 1360
 Phe Val Leu Val Asp Val Asp Gly Thr Pro Glu Ser Trp Gln Ala Leu
 1365 1370 1375
 Pro Ala Ala Val Arg Ala Gly Glu Pro Gln Leu Ala Leu Arg Arg Gly
 1380 1385 1390
 Val Ala Leu Val Pro Arg Leu Ala Arg Leu Thr Val Arg Glu Glu Gly
 1395 1400 1405
 Ser Ser Pro Gln Leu Asp Thr Asp Gly Thr Val Leu Ile Thr Gly Gly
 1410 1415 1420

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Thr Gly Ala Leu Gly Gly Val Val Ala Arg His Leu Val Glu Glu His | | | |
| 1425 | 1430 | 1435 | 1440 |
| Gly Ile Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp Asn Ala Pro | | | |
| | 1445 | 1450 | 1455 |
| Gly Val His Glu Leu Val Asp Glu Leu Ala Arg Ala Gly Ala Val Val | | | |
| | 1460 | 1465 | 1470 |
| Glu Val Val Ala Cys Asp Val Ala Asp Arg Thr Asp Leu Glu His Val | | | |
| | 1475 | 1480 | 1485 |
| Leu Ala Ala Ile Pro Val Asp Trp Pro Leu Arg Gly Ile Val His Thr | | | |
| | 1490 | 1495 | 1500 |
| Ala Gly Val Leu Ala Asp Gly Val Ile Gly Ser Leu Ser Ala Ala Asp | | | |
| 1505 | 1510 | 1515 | 1520 |
| Val Gly Thr Val Phe Ala Pro Lys Val Thr Gly Ala Trp His Leu His | | | |
| | 1525 | 1530 | 1535 |
| Glu Leu Thr Arg Asp Leu Asp Leu Ser Phe Phe Val Leu Phe Ser Ser | | | |
| | 1540 | 1545 | 1550 |
| Phe Ser Gly Ile Ala Gly Ala Ala Gly Gln Ala Asn Tyr Ala Ala Ala | | | |
| | 1555 | 1560 | 1565 |
| Asn Thr Phe Leu Asp Ala Leu Ala Arg Tyr Arg Arg Ala Arg Gly Leu | | | |
| | 1570 | 1575 | 1580 |
| Pro Gly Leu Ser Leu Ala Trp Gly Leu Trp Ala Gln Pro Ser Gly Met | | | |
| 1585 | 1590 | 1595 | 1600 |
| Thr Ser Gly Leu Asp Ala Ala Ser Val Glu Arg Leu Ala Arg Thr Gly | | | |
| | 1605 | 1610 | 1615 |
| Ile Ala Glu Leu Ser Thr Glu Asp Gly Leu Arg Leu Phe Asp Ala Ala | | | |
| | 1620 | 1625 | 1630 |
| Phe Ala Lys Asp Arg Ala Cys Val Val Ala Ala Arg Leu Asp Arg Ala | | | |
| | 1635 | 1640 | 1645 |
| Leu Leu Val Gly Asn Gly Arg Ser His Ala Ile Pro Ala Leu Leu Ser | | | |
| | 1650 | 1655 | 1660 |
| Ala Leu Val Pro Val Arg Gly Gly Val Ala Arg Lys Thr Ala Asn Ser | | | |
| 1665 | 1670 | 1675 | 1680 |
| Gln Ala Ala Asp Glu Asp Ala Leu Leu Gly Leu Val Arg Glu His Val | | | |
| | 1685 | 1690 | 1695 |
| Ser Ala Val Leu Gly Tyr Ser Gly Ala Val Glu Val Gly Gly Asp Arg | | | |
| | 1700 | 1705 | 1710 |
| Ala Phe Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Leu Arg | | | |
| | 1715 | 1720 | 1725 |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Asn Arg Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val | | | |
| 1730 | 1735 | 1740 | |
| Phe Asp Tyr Pro Thr Pro Arg Ala Leu Ala Arg Phe Leu His Gln Glu | | | |
| 1745 | 1750 | 1755 | 1760 |
| Leu Ala Gly Glu Val Ala Ser Thr Ser Thr Pro Val Thr Arg Ala Ala | | | |
| 1765 | 1770 | 1775 | |
| Ser Ala Glu Glu Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe | | | |
| 1780 | 1785 | 1790 | |
| Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly | | | |
| 1795 | 1800 | 1805 | |
| Gly Val Asp Ala Val Ala Gly Phe Pro Asp Asp Arg Gly Trp Asp Leu | | | |
| 1810 | 1815 | 1820 | |
| Ala Ala Leu Tyr Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr Val | | | |
| 1825 | 1830 | 1835 | 1840 |
| Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Asp Met | | | |
| 1845 | 1850 | 1855 | |
| Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg | | | |
| 1860 | 1865 | 1870 | |
| Leu Leu Leu Glu Val Ala Trp Glu Thr Leu Glu Arg Ala Gly Ile Asp | | | |
| 1875 | 1880 | 1885 | |
| Pro Phe Ser Leu His Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met | | | |
| 1890 | 1895 | 1900 | |
| Tyr His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly Phe | | | |
| 1905 | 1910 | 1915 | 1920 |
| Glu Gly His Leu Gly Thr Gly Asn Ala Gly Ser Val Leu Ser Gly Arg | | | |
| 1925 | 1930 | 1935 | |
| Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr | | | |
| 1940 | 1945 | 1950 | |
| Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu | | | |
| 1955 | 1960 | 1965 | |
| Arg Ala Gly Glu Cys Glu Phe Ala Leu Ala Gly Gly Val Thr Val Met | | | |
| 1970 | 1975 | 1980 | |
| Ser Thr Pro Thr Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala | | | |
| 1985 | 1990 | 1995 | 2000 |
| Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Asp Gly Thr Gly | | | |
| 2005 | 2010 | 2015 | |
| Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala | | | |
| 2020 | 2025 | 2030 | |

| | | |
|-----------------------------------------------------------------|------|-----------|
| Arg Arg Asn Gly His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val | | |
| 2035 | 2040 | 2045 |
| Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser | | |
| 2050 | 2055 | 2060 |
| Gln Gln Arg Val Ile Thr Gln Ala Leu Thr Ser Ala Gly Leu Ser Val | | |
| 2065 | 2070 | 2075 2080 |
| Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly | | |
| 2085 | 2090 | 2095 |
| Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg | | |
| 2100 | 2105 | 2110 |
| Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly | | |
| 2115 | 2120 | 2125 |
| His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met | | |
| 2130 | 2135 | 2140 |
| Ala Met Arg Gln Gly Glu Leu Pro Arg Thr Leu His Val Asp Glu Pro | | |
| 2145 | 2150 | 2155 2160 |
| Ser Ala Gln Val Asp Trp Ser Ala Gly Thr Val Gln Leu Leu Thr Glu | | |
| 2165 | 2170 | 2175 |
| Asn Thr Pro Trp Pro Asp Ser Gly Arg Leu Arg Arg Ala Gly Val Ser | | |
| 2180 | 2185 | 2190 |
| Ser Phe Gly Ile Ser Gly Thr Asn Ala His Leu Ile Leu Glu Gln Pro | | |
| 2195 | 2200 | 2205 |
| Pro Arg Glu Ser Gln Arg Ser Thr Glu Pro Asp Ser Gly Ser Val Arg | | |
| 2210 | 2215 | 2220 |
| Asp Phe Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala | | |
| 2225 | 2230 | 2235 2240 |
| Leu Ser Ala Gln Ala Asp Ala Leu Met Ser Tyr Leu Ser Asn Arg Val | | |
| 2245 | 2250 | 2255 |
| Asp Ala Ser Pro Arg Asp Ile Gly Tyr Ser Leu Ala Val Thr Arg Pro | | |
| 2260 | 2265 | 2270 |
| Ala Leu Asp His Arg Ala Val Val Leu Gly Ala Asp Arg Ala Ala Leu | | |
| 2275 | 2280 | 2285 |
| Leu Pro Gly Leu Lys Ala Leu Ala Val Ser Asn Asp Ala Ala Glu Val | | |
| 2290 | 2295 | 2300 |
| Ile Thr Gly Thr Arg Ala Ala Gly Pro Val Gly Phe Val Phe Ser Gly | | |
| 2305 | 2310 | 2315 2320 |
| Gln Gly Gly Gln Trp Pro Gly Met Gly Ser Gly Leu His Ser Ala Phe | | |
| 2325 | 2330 | 2335 |

Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Cys Glu Leu Asp Ala
 2340 2345 2350
 His Leu Gly Gln Met Ala Arg Leu Arg Asp Val Leu Ser Gly Ser Asp
 2355 2360 2365
 Thr Gln Leu Leu Asp Gln Thr Leu Trp Ala Gln Pro Gly Leu Phe Ala
 2370 2375 2380
 Leu Gln Val Gly Leu Trp Glu Leu Leu Gly Ser Trp Gly Val Arg Pro
 2385 2390 2395 2400
 Ala Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe Ala
 2405 2410 2415
 Ala Gly Val Leu Ser Leu Arg Asp Ala Ala Arg Leu Val Ala Gly Arg
 2420 2425 2430
 Ala Arg Leu Met Gln Ala Leu Pro Thr Gly Gly Ala Met Leu Ala Ala
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 Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala Asp Cys Gly Asp
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 Arg Val Gly Ile Ala Ala Val Asn Ala Pro Gly Ser Val Val Leu Ser
 2465 2470 2475 2480
 Gly Asp Arg Asp Val Leu Asp Asp Ile Ala Gly Arg Leu Asp Gly Gln
 2485 2490 2495
 Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser His
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 Arg Met Asp Pro Met Leu Ala Glu Phe Thr Glu Ile Ala Arg Ser Val
 2515 2520 2525
 Asp Tyr Arg Ser Ser Gly Leu Pro Ile Val Ser Thr Leu Thr Gly Glu
 2530 2535 2540
 Leu Asp Glu Val Gly Met Pro Ala Thr Pro Glu Tyr Trp Val Arg Gln
 2545 2550 2555 2560
 Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Ala Ala Leu Ala Ala
 2565 2570 2575
 His Gly Val Ser Thr Val Val Glu Val Gly Pro Asp Gly Val Leu Ser
 2580 2585 2590
 Ala Leu Val Gln Glu Cys Ala Ala Gly Ser Asp Gln Gly Gly Arg Val
 2595 2600 2605
 Ala Ala Val Pro Leu Met Arg Ser Asn Arg Asp Glu Ala His Thr Val
 2610 2615 2620
 Thr Thr Ala Leu Ala Gln Ile His Val Arg Gly Ala Glu Val Asp Trp
 2625 2630 2635 2640

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Val Glu Leu Pro Thr | 2645 | 2650 | 2655 |
| Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ser Pro Ser Glu Pro | 2660 | 2665 | 2670 |
| Val Gly Gln Ser Ala Asp Pro Ala Arg Gln Ser Gly Phe Trp Glu Leu | 2675 | 2680 | 2685 |
| Val Glu Gln Glu Asp Val Ser Ala Leu Ser Ala Ala Leu His Ile Thr | 2690 | 2695 | 2700 |
| Gly Asp His Asp Val Gln Ala Ser Leu Glu Ser Val Val Pro Val Leu | 2705 | 2710 | 2715 |
| Ser Ser Trp His Arg Arg Ile Arg Asn Glu Ser Leu Val His Gln Trp | 2725 | 2730 | 2735 |
| Arg Tyr Arg Ile Ser Trp His Glu Arg Ala Asp Leu Pro Asp Pro Ser | 2740 | 2745 | 2750 |
| Leu Ser Gly Thr Trp Leu Val Val Val Pro Glu Gly Trp Ser Ala Ser | 2755 | 2760 | 2765 |
| Arg Gln Val Leu Arg Phe Asn Glu Met Phe Glu Glu Arg Gly Cys Pro | 2770 | 2775 | 2780 |
| Ala Val Leu Phe Glu Leu Ala Gly His Asp Glu Glu Ala Leu Ala Gln | 2785 | 2790 | 2795 |
| Arg Phe Arg Ser Leu Pro Val Ala Ser Gly Gly Ile Ser Gly Val Leu | 2805 | 2810 | 2815 |
| Ser Leu Leu Ala Leu Asp Glu Ser Pro Ser Ser Pro Asn Ala Ala Leu | 2820 | 2825 | 2830 |
| Pro Asn Gly Ala Leu Asn Ser Leu Val Leu Leu Arg Ala Leu Arg Ala | 2835 | 2840 | 2845 |
| Ala Asp Val Ser Ala Pro Leu Trp Leu Ala Thr Cys Gly Gly Val Ala | 2850 | 2855 | 2860 |
| Val Gly Asp Val Pro Val Asn Pro Gly Gln Ala Leu Val Trp Gly Leu | 2865 | 2870 | 2875 |
| Gly Arg Val Val Gly Leu Glu His Pro Ala Trp Trp Gly Gly Leu Val | 2885 | 2890 | 2895 |
| Asp Val Pro Cys Leu Leu Asp Glu Asp Ala Arg Glu Arg Leu Ser Val | 2900 | 2905 | 2910 |
| Val Leu Ala Gly Leu Gly Glu Asp Glu Ile Ala Val Arg Pro Gly Gly | 2915 | 2920 | 2925 |
| Val Phe Val Arg Arg Leu Glu Arg Ala Gly Ala Ala Ser Gly Ala Gly | 2930 | 2935 | 2940 |

Ser Val Trp Arg Pro Arg Gly Thr Val Leu Val Thr Gly Gly Thr Gly
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Gly Leu Gly Ala His Val Ala Arg Trp Leu Ala Gly Ala Gly Ala Glu
 2965 2970 2975

His Val Val Leu Thr Ser Arg Arg Gly Ala Ala Ala Pro Gly Ala Gly
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Asp Leu Arg Ala Glu Leu Glu Ala Leu Gly Ala Arg Val Ser Ile Thr
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Ala Cys Asp Val Ala Asp Arg Asp Ala Leu Ala Glu Val Leu Ala Thr
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Ile Pro Asp Asp Cys Pro Leu Thr Ala Val Met His Ala Ala Gly Val
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Val Glu Val Gly Asp Val Ala Ser Met Cys Leu Thr Asp Phe Val Gly
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Val Leu Ser Ala Lys Ala Gly Gly Ala Ala Asn Leu Asp Glu Leu Leu
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Ala Asp Val Glu Leu Asp Ala Phe Val Leu Phe Ser Ser Val Ser Gly
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Val Trp Gly Ala Gly Gly Gln Gly Ala Tyr Ala Ala Ala Asn Ala Tyr
 3090 3095 3100

Leu Asp Ala Leu Ala Gln Gln Arg Arg Ala Arg Gly Leu Val Gly Thr
 3105 3110 3115 3120

Ala Val Ala Trp Gly Pro Trp Ala Gly Asp Gly Met Ala Ala Gly Glu
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Gly Gly Ala Gln Leu Arg Arg Ala Gly Leu Val Pro Met Ala Ala Asp
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Arg Ala Leu Leu Ala Leu Gln Gly Ala Leu Asp Arg Asp Glu Thr Ser
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Leu Val Val Ala Asp Met Ala Trp Glu Arg Phe Ala Pro Val Phe Ala
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Met Ser Arg Arg Arg Pro Leu Leu Asp Glu Leu Pro Glu Ala Gln Gln
 3185 3190 3195 3200

Ala Leu Ala Asp Ala Glu Asn Thr Thr Asp Ala Ala Asp Ser Ala Val
 3205 3210 3215

Pro Leu Pro Arg Leu Ala Gly Met Ala Ala Ala Glu Arg Arg Arg Ala
 3220 3225 3230

Met Leu Asp Leu Val Leu Ala Glu Ala Ser Ile Val Leu Gly His Asn
 3235 3240 3245

Gly Ser Asp Pro Val Gly Pro Asp Arg Ala Phe Gln Glu Leu Gly Phe
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Asp Ser Leu Met Ala Val Glu Leu Arg Asn Arg Leu Gly Glu Ala Thr
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Gly Leu Ser Leu Pro Ala Thr Leu Ile Phe Asp Tyr Pro Ser Pro Ser
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Ala Leu Ala Glu Gln Leu Val Gly Glu Leu Val Gly Ala Gln Pro Ala
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Thr Thr Val Val Ala Gly Ala Asp Pro Val Asp Asp Pro Val Val Val
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Val Ala Met Gly Cys Arg Tyr Pro Gly Asp Val Cys Ser Pro Glu Glu
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Leu Trp Gln Leu Val Ser Ala Gly Arg Asp Ala Val Ser Thr Phe Pro
 3345 3350 3355 3360

Val Asp Arg Gly Trp Asp Cys Asn Thr Leu Phe Asp Pro Asp Pro Asp
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Arg Ala Gly Ser Thr Tyr Val Arg Glu Gly Ala Phe Leu Thr Gly Ala
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Asp Arg Phe Asp Ala Gly Phe Phe Gly Ile Ser Pro Arg Glu Ala Arg
 3395 3400 3405

Ala Met Asp Pro Gln Gln Arg Leu Leu Leu Glu Val Ala Trp Glu Val
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Phe Glu Arg Ala Gly Ile Ala Pro Leu Ser Leu Arg Gly Ser Arg Thr
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Gly Val Phe Ala Gly Thr Asn Gly Gln Asp His Gly Ala Lys Val Ala
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Ala Ala Pro Glu Ala Ala Gly His Leu Leu Thr Gly Asn Ala Ala Ser
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Val Leu Ala Gly Arg Leu Ser Tyr Thr Phe Gly Leu Glu Gly Pro Ala
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Val Ala Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu
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Ala Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Met Ala Leu Ala Gly
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Gly Val Thr Val Met Ser Thr Pro Leu Ala Phe Leu Glu Phe Ser Arg
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Gln Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala
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Ala Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu
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 Pro Asn Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn
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 Gly Thr Gly Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr
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 Tyr Gly Gln Glu Arg Asp Pro Glu Arg Ala Leu Trp Leu Gly Ser Ile
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 Lys Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val
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 Ile Lys Met Val Gln Ala Met Arg His Gly Glu Leu Pro Ala Thr Leu
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 His Val Asp Lys Pro Thr Pro Gln Val Asp Trp Ser Ala Gly Ala Val
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 Arg Leu Leu Thr Gly Asn Thr Pro Trp Pro Glu Ser Gly Arg Pro Arg
 3715 3720 3725
 Arg Ala Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Leu
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 3765 3770 3775
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 Asp Arg Glu Ala Leu Leu Ser Arg Leu Ala Ala Leu Ala Asp Gly Arg
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 Thr Ala Pro Gly Val Ile Thr Gly Ser Ala Asn Ser Gly Gly Arg Ile
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Gly Phe Val Phe Ser Gly Gln Gly Ser Gln Trp Leu Gly Met Gly Lys
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 Cys Asp Ala Leu Ser Ala His Leu Gly Ala Asp Val Arg Gly Val Leu
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 Phe Gly Ala Asp Glu Gln Met Leu Asp Arg Thr Leu Trp Ala Gln Ser
 3905 3910 3915 3920
 Gly Ile Phe Ala Val Gln Val Gly Leu Leu Gly Leu Leu Arg Ser Trp
 3925 3930 3935
 Gly Val Arg Pro Ala Ala Val Leu Gly His Ser Val Gly Glu Leu Ala
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 3955 3960 3965
 Val Ala Ala Arg Ala His Leu Met Gln Ala Leu Pro Thr Gly Gly Ala
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 Met Leu Ala Val Ala Thr Ser Glu Ala Ala Val Gly Pro Leu Leu Ser
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 Phe Asp Ala Arg Gly Leu Arg Thr Lys Trp Leu Arg Val Ser His Ala
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 Phe His Ser His Arg Met Glu Pro Ile Leu Asp Glu Tyr Ala Glu Thr
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 Ala Arg Cys Val Glu Phe Gly Glu Pro Val Val Pro Ile Val Ser Ala
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 Trp Thr Arg Gln Val Arg Asp Pro Val Arg Phe Gly Asp Gly Val Arg
 4100 4105 4110
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 Gly Ala Leu Ser Ala Leu Val Glu Gln Cys Leu Ala Gly Ser Asp Gln
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 Ala Gly Arg Val Ala Ala Ile Pro Leu Met Arg Arg Asp Arg Asp Glu
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Val Glu Thr Ala Val Ala Ala Leu Ala His Val His Val Arg Gly Gly
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Ala Val Asp Trp Ser Ala Cys Phe Ala Gly Thr Gly Ala Arg Thr Val
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Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Ala Gly
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Glu Leu Cys Ile Asp Arg Asp Gln Pro Phe Arg Glu Val Leu Pro Val
4245 4250 4255
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Ala Leu Arg Gly Val Trp Leu Val Val Leu Pro Ala Asp Val Pro Arg
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Asp Gln Pro Ala Val Val Ile Asp Ala Leu Ile Ala Arg Gly Ala Glu
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Val Asp Lys Val Arg Ala Val Ile Ala Asp Arg Thr Glu Val Thr Gly
4340 4345 4350
Val Leu Ser Leu Leu Ala Met Asp Gly Met Pro Cys Ala Ala His Pro
4355 4360 4365
His Leu Ser Arg Gly Val Ala Ala Thr Val Ile Leu Thr Gln Val Leu
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Gly Asp Ala Gly Val Ser Ala Pro Leu Trp Leu Ala Thr Thr Gly Gly
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Val Glu Ala Gly Thr Glu Asp Gly Pro Ala Asp Pro Asp His Gly Leu
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Ile Trp Gly Leu Gly Arg Val Val Gly Leu Glu His Pro Gln Trp Trp
4420 4425 4430
Gly Gly Leu Ile Asp Leu Pro Glu Thr Leu Asp Glu Thr Ser Arg Asn
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4450 4455 4460

Val Arg Ser Ser Gly Leu Phe Val Arg Arg Val Val Arg Ala Ala Arg
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Asn Pro Arg Ser Glu Thr Trp Arg Ser Arg Gly Thr Val Leu Ile Thr
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Gly Gly Thr Gly Ala Leu Gly Ala Glu Val Ala Arg Trp Leu Ala Arg
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Pro Gly Ala Ala Asp Leu Gly Ala Glu Leu Thr Glu Leu Gly Val Lys
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Val Thr Val Leu Ala Cys Asp Val Thr Asp Arg Asp Glu Leu Ala Ala
4545 4550 4555 4560
Val Leu Ala Ala Val Pro Thr Glu Tyr Pro Leu Ser Ala Val Val His
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Thr Ala Gly Val Gly Thr Pro Ala Asn Leu Ala Glu Thr Thr Leu Ala
4580 4585 4590
Gln Phe Ala Asp Val Leu Ser Ala Lys Val Val Gly Ala Ala Asn Leu
4595 4600 4605
Asp Arg Leu Leu Gly Gly Gln Pro Leu Asp Ala Phe Val Leu Phe Ser
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Ser Ile Ser Gly Val Trp Gly Ala Gly Gly Gln Gly Ala Tyr Ser Ala
4625 4630 4635 4640
Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Arg Arg Arg Ala Cys Gly
4645 4650 4655
Arg Pro Ala Thr Cys Ile Ala Trp Gly Pro Trp Ala Gly Ala Gly Met
4660 4665 4670
Ala Val Gln Glu Gly Asn Glu Ala His Leu Arg Arg Arg Gly Leu Val
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Pro Met Glu Pro Gln Ser Ala Leu Phe Ala Leu Gln Gln Ala Leu Ser
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Gln Arg Glu Thr Ala Ile Thr Val Ala Asp Val Asp Trp Glu Arg Phe
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Ala Ala Ser Phe Thr Ala Ala Arg Pro Arg Pro Leu Leu Glu Glu Ile
4725 4730 4735
Val Asp Leu Arg Pro Asp Thr Glu Thr Glu Glu Lys His Gly Ala Gly
4740 4745 4750
Glu Leu Gly Gln Gln Leu Ala Ala Leu Pro Pro Ala Glu Arg Gly His
4755 4760 4765

Leu Leu Leu Glu Val Val Leu Ala Glu Thr Ala Ser Thr Leu Gly His
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 Asp Ser Ala Glu Ala Val Gln Pro Asp Arg Thr Phe Ala Glu Leu Gly
 4785 4790 4795 4800
 Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn Ala Val
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 Thr Gly Leu Arg Leu Pro Pro Thr Leu Val Phe Asp His Pro Thr Pro
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 Asn Gly Ile Glu Ser Leu Leu Ala Glu Leu Asp Arg Leu Asp Thr Thr
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 Glu Arg Leu His Ala Leu Leu Ala Lys Trp Asp Gly Ala Arg Asp Gly
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 Thr Ala Arg Ala Thr Ser Pro Gln Ser Leu Thr Ala Ala Thr Asp Asp
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<220>
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 <222> (1)..(16764)
 <223> ORF22; polyketide synthase

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 Met Ala Asn Glu Glu Lys Leu Arg Glu Tyr Leu Lys Arg Val Val Val
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 Glu Leu Glu Glu Ala His Glu Arg Leu His Glu Leu Glu Arg Gln Glu
 20 25 30
 cac gac ccc atc gcg atc gtg tcg atg gga tgt cgt tat ccc ggt ggc 144
 His Asp Pro Ile Ala Ile Val Ser Met Gly Cys Arg Tyr Pro Gly Gly
 35 40 45
 gtc tcc act ccg gag gag ctg tgg cga ctg gtc gtc gac gga gga gac 192
 Val Ser Thr Pro Glu Glu Leu Trp Arg Leu Val Val Asp Gly Gly Asp

| 50 | 55 | 60 | |
|-----------------------------------------------------------------|-----|-----|-----|
| gcg atc gcg aac ttc ccc gaa gac cgt ggc tgg aat ctg gac gag ctg | | | 240 |
| Ala Ile Ala Asn Phe Pro Glu Asp Arg Gly Trp Asn Leu Asp Glu Leu | | | |
| 65 | 70 | 75 | 80 |
| ttc gat cct gat ccg ggc cga gcc ggg acc tcc tac gtc cgc gag ggt | | | 288 |
| Phe Asp Pro Asp Pro Gly Arg Ala Gly Thr Ser Tyr Val Arg Glu Gly | | | |
| | 85 | 90 | 95 |
| ggt ttc ctg cgc ggg gtc gcg gac ttc gat gcc ggg ctc ttc ggg atc | | | 336 |
| Gly Phe Leu Arg Gly Val Ala Asp Phe Asp Ala Gly Leu Phe Gly Ile | | | |
| | 100 | 105 | 110 |
| agt ccg cgc gag gca cag gcg atg gac ccg caa cag cgg ttg ctg ctg | | | 384 |
| Ser Pro Arg Glu Ala Gln Ala Met Asp Pro Gln Gln Arg Leu Leu Leu | | | |
| | 115 | 120 | 125 |
| gag atc tcg tgg gag gtg ttc gag cgc gcc ggc att gac ccg ttt tct | | | 432 |
| Glu Ile Ser Trp Glu Val Phe Glu Arg Ala Gly Ile Asp Pro Phe Ser | | | |
| | 130 | 135 | 140 |
| ttg cgg ggt acc aag acc ggt gtg ttc gcg ggc ctg atc tac cac gac | | | 480 |
| Leu Arg Gly Thr Lys Thr Gly Val Phe Ala Gly Leu Ile Tyr His Asp | | | |
| 145 | 150 | 155 | 160 |
| tac gcg tcg cgg ttt cgc aag acc ccc gcg gag ttc gag ggt tac ttc | | | 528 |
| Tyr Ala Ser Arg Phe Arg Lys Thr Pro Ala Glu Phe Glu Gly Tyr Phe | | | |
| | 165 | 170 | 175 |
| gcc acc ggc aac gcg ggc agc gtc gca tcc ggc cgg gtg gct tac acc | | | 576 |
| Ala Thr Gly Asn Ala Gly Ser Val Ala Ser Gly Arg Val Ala Tyr Thr | | | |
| | 180 | 185 | 190 |
| ttc ggg tta gag ggc ccg gcg gtc acc gtg gac acc gcc tgc tcg tcg | | | 624 |
| Phe Gly Leu Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser | | | |
| | 195 | 200 | 205 |
| tcc ctg gtg gcg ctg cac ctg gcc tgc cag tcc ctg cgg ctg ggc gaa | | | 672 |
| Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Leu Gly Glu | | | |
| | 210 | 215 | 220 |
| tgc gac ctg gcc ctg gcc ggt ggc att tcg gtg atg gcc acg ccg gga | | | 720 |
| Cys Asp Leu Ala Leu Ala Gly Gly Ile Ser Val Met Ala Thr Pro Gly | | | |
| 225 | 230 | 235 | 240 |
| gcc ttc gtc gag ttc agc cgg caa cgc gca ctc gcc tcg gat ggc cgg | | | 768 |
| Ala Phe Val Glu Phe Ser Arg Gln Arg Ala Leu Ala Ser Asp Gly Arg | | | |
| | 245 | 250 | 255 |
| tgc aag ccc ttc gcg gat gcc gcc gac ggc acc ggc tgg ggc gag ggc | | | 816 |
| Cys Lys Pro Phe Ala Asp Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly | | | |
| | 260 | 265 | 270 |
| gcc gga atg ctg ctg ctg gaa cgg ctg tcg gac gca cga cga aac ggc | | | 864 |
| Ala Gly Met Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly | | | |
| | 275 | 280 | 285 |

| | |
|-----------------------------------------------------------------|------|
| cac ccg gtg ctg gcg gcg gtg gtc ggt tcc gcg atc aac cag gac ggg | 912 |
| His Pro Val Leu Ala Ala Val Val Gly Ser Ala Ile Asn Gln Asp Gly | |
| 290 295 300 | |
| acg tcc aac ggc ctg acc gcg ccc agc ggt ccc gca cag cag cga gtg | 960 |
| Thr Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln Gln Arg Val | |
| 305 310 315 320 | |
| atc cgc caa gcc ctg gcg aac gcc ggg ttg tcg ccc gcc gag gtc gat | 1008 |
| Ile Arg Gln Ala Leu Ala Asn Ala Gly Leu Ser Pro Ala Glu Val Asp | |
| 325 330 335 | |
| gtg gtc gag gcg cac ggc acg ggc acg gcc ttg ggc gac ccg atc gag | 1056 |
| Val Val Glu Ala His Gly Thr Gly Thr Ala Leu Gly Asp Pro Ile Glu | |
| 340 345 350 | |
| gcg cag gcc ctg atc gcc acc tac ggg gcg aac cgg tcg gcg gat cat | 1104 |
| Ala Gln Ala Leu Ile Ala Thr Tyr Gly Ala Asn Arg Ser Ala Asp His | |
| 355 360 365 | |
| ccg ctg ctg ctg ggt tcc ctc aag tcg aac atc ggc cac acc cag gct | 1152 |
| Pro Leu Leu Leu Gly Ser Leu Lys Ser Asn Ile Gly His Thr Gln Ala | |
| 370 375 380 | |
| gcc gcc ggt gtg gcc ggg gtg atc aag tcg gtc ctg gcc atc agg cac | 1200 |
| Ala Ala Gly Val Ala Gly Val Ile Lys Ser Val Leu Ala Ile Arg His | |
| 385 390 395 400 | |
| cgg gag atg ccc cgc agc ctg cac atc gac cag cca tcg cag cac gtg | 1248 |
| Arg Glu Met Pro Arg Ser Leu His Ile Asp Gln Pro Ser Gln His Val | |
| 405 410 415 | |
| gac tgg tcg gcg ggc gcg gtg cgg ctg ctc acg gac agc gtt gac tgg | 1296 |
| Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Asp Ser Val Asp Trp | |
| 420 425 430 | |
| ccg gat ctc ggc agg ccg cgc cga gca ggg gtg tcc tcg ttc ggc atg | 1344 |
| Pro Asp Leu Gly Arg Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Met | |
| 435 440 445 | |
| agc ggt acc aac gca cac ctg atc gtc gag gaa gta tcc gac gag ccg | 1392 |
| Ser Gly Thr Asn Ala His Leu Ile Val Glu Glu Val Ser Asp Glu Pro | |
| 450 455 460 | |
| gtc tcg ggc agt acc gag ccg acc ggg gca ttt ccc tgg ccg ctg tcc | 1440 |
| Val Ser Gly Ser Thr Glu Pro Thr Gly Ala Phe Pro Trp Pro Leu Ser | |
| 465 470 475 480 | |
| ggc aag acg gag acg gca ttg cgc gag cag gct gcc gag ttg ctc tcc | 1488 |
| Gly Lys Thr Glu Thr Ala Leu Arg Glu Gln Ala Ala Glu Leu Leu Ser | |
| 485 490 495 | |
| gta gtg acc gag cac ccg gag ccg gga ctg ggg gac gtc ggg tac tcg | 1536 |
| Val Val Thr Glu His Pro Glu Pro Gly Leu Gly Asp Val Gly Tyr Ser | |
| 500 505 510 | |

| | |
|-----------------------------------------------------------------|------|
| ctg gcc acc ggt cgc gct gcg atg gag cac cgg gct gtc gtg gtt gcc | 1584 |
| Leu Ala Thr Gly Arg Ala Ala Met Glu His Arg Ala Val Val Val Ala | |
| 515 520 525 | |
| gac gat cgg gac tct ttc gtc gcc gga ctg acg gcg ttg gct gcg ggc | 1632 |
| Asp Asp Arg Asp Ser Phe Val Ala Gly Leu Thr Ala Leu Ala Ala Gly | |
| 530 535 540 | |
| gtt ccg gca gcc aac gtg gtg cag ggc gcg gcc gac tgc aag gga aag | 1680 |
| Val Pro Ala Ala Asn Val Val Gln Gly Ala Ala Asp Cys Lys Gly Lys | |
| 545 550 555 560 | |
| gtc gcg ttc gtg ttc ccc ggc cag ggc tcg cat tgg cag ggg atg gcg | 1728 |
| Val Ala Phe Val Phe Pro Gly Gln Gly Ser His Trp Gln Gly Met Ala | |
| 565 570 575 | |
| agg gaa ctg tcc gaa tcc tcg ccg gtg ttc cgg cgg aag ctg gcg gaa | 1776 |
| Arg Glu Leu Ser Glu Ser Ser Pro Val Phe Arg Arg Lys Leu Ala Glu | |
| 580 585 590 | |
| tgc gcg gcg gct acg gcc cct tac gtg gac tgg tcg ctg ctc ggc gtc | 1824 |
| Cys Ala Ala Ala Thr Ala Pro Tyr Val Asp Trp Ser Leu Leu Gly Val | |
| 595 600 605 | |
| ctt cgc ggt gat ccc gat gca ccc gcg ctg gat cgc gac gac gtg att | 1872 |
| Leu Arg Gly Asp Pro Asp Ala Pro Ala Leu Asp Arg Asp Asp Val Ile | |
| 610 615 620 | |
| cag ctc gcg ctg ttc gcc atg atg gtg tcg ctg gcc gaa ctg tgg cgt | 1920 |
| Gln Leu Ala Leu Phe Ala Met Met Val Ser Leu Ala Glu Leu Trp Arg | |
| 625 630 635 640 | |
| tcg tgc gga gtg gag ccc gcc gcg gtg gtc ggt cat tcc cag ggc gag | 1968 |
| Ser Cys Gly Val Glu Pro Ala Ala Val Val Gly His Ser Gln Gly Glu | |
| 645 650 655 | |
| atc gcc gcc gcc cat gtg gca ggc gct ttg tcc ttg act gat gcg gtg | 2016 |
| Ile Ala Ala Ala His Val Ala Gly Ala Leu Ser Leu Thr Asp Ala Val | |
| 660 665 670 | |
| cgc atc atc gct gcc cgc tgc gat gcg gtg tcg gcg ctg acc ggg aag | 2064 |
| Arg Ile Ile Ala Ala Arg Cys Asp Ala Val Ser Ala Leu Thr Gly Lys | |
| 675 680 685 | |
| gga ggc atg ctc gcg att gcc ttg ccg gaa agc gcg gtg gtg aag cga | 2112 |
| Gly Gly Met Leu Ala Ile Ala Leu Pro Glu Ser Ala Val Val Lys Arg | |
| 690 695 700 | |
| atc gca ggc ctg ccg gag ctg acc gtt gcg gcg gtc aac gga ccc ggc | 2160 |
| Ile Ala Gly Leu Pro Glu Leu Thr Val Ala Ala Val Asn Gly Pro Gly | |
| 705 710 715 720 | |
| tcc act gtc gtt tcc ggc gaa ccg tcg gct ctg gag cgt ctg cag acc | 2208 |
| Ser Thr Val Val Ser Gly Glu Pro Ser Ala Leu Glu Arg Leu Gln Thr | |
| 725 730 735 | |
| gaa ctg acc gcg gaa aac gtg cag acc cgg cgg gtg gga att gat tac | 2256 |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Glu | Leu | Thr | Ala | Glu | Asn | Val | Gln | Thr | Arg | Arg | Val | Gly | Ile | Asp | Tyr | |
| | | | 740 | | | | | 745 | | | | | 750 | | | |
| gcc | tcg | cat | tcg | ccg | cag | atc | gcg | cag | gtc | cag | ggc | cgg | ctt | ctg | gac | 2304 |
| Ala | Ser | His | Ser | Pro | Gln | Ile | Ala | Gln | Val | Gln | Gly | Arg | Leu | Leu | Asp | |
| | | 755 | | | | | 760 | | | | 765 | | | | | |
| cgg | ctg | ggc | gaa | gtc | ggg | tcc | gaa | cct | gct | gag | atc | gct | ttc | tac | tcg | 2352 |
| Arg | Leu | Gly | Glu | Val | Gly | Ser | Glu | Pro | Ala | Glu | Ile | Ala | Phe | Tyr | Ser | |
| | 770 | | | | | 775 | | | | | 780 | | | | | |
| acg | gtc | acc | ggc | gag | cgg | acg | gac | acc | ggc | cga | ctc | gac | gcc | gac | tac | 2400 |
| Thr | Val | Thr | Gly | Glu | Arg | Thr | Asp | Thr | Gly | Arg | Leu | Asp | Ala | Asp | Tyr | |
| | 785 | | | | 790 | | | | 795 | | | | | | 800 | |
| tgg | tac | cag | aac | ctt | cgg | cag | ccc | gtc | cgc | ttc | cag | cag | acc | gtc | gcc | 2448 |
| Trp | Tyr | Gln | Asn | Leu | Arg | Gln | Pro | Val | Arg | Phe | Gln | Gln | Thr | Val | Ala | |
| | | | 805 | | | | | | 810 | | | | | 815 | | |
| cgg | atg | gca | gat | cag | ggc | tat | cgg | ttc | ttc | gtc | gag | gtg | agc | ccg | cac | 2496 |
| Arg | Met | Ala | Asp | Gln | Gly | Tyr | Arg | Phe | Phe | Val | Glu | Val | Ser | Pro | His | |
| | | 820 | | | | | 825 | | | | | 830 | | | | |
| ccg | ctg | ctc | acc | gcc | gga | atc | cag | gaa | acg | ctg | gaa | gcc | gcg | gac | gcg | 2544 |
| Pro | Leu | Leu | Thr | Ala | Gly | Ile | Gln | Glu | Thr | Leu | Glu | Ala | Ala | Asp | Ala | |
| | | 835 | | | | | 840 | | | | | 845 | | | | |
| ggc | ggg | gtg | gtg | gtc | ggg | tcg | ctg | cgg | cgt | ggc | gag | ggc | ggc | tcc | cgg | 2592 |
| Gly | Gly | Val | Val | Val | Gly | Ser | Leu | Arg | Arg | Gly | Glu | Gly | Gly | Ser | Arg | |
| | 850 | | | | | 855 | | | | | 860 | | | | | |
| cgc | tgg | ctg | act | tcg | ctg | gcc | gag | tgc | cag | gtg | cgc | gga | ctg | ccg | gtg | 2640 |
| Arg | Trp | Leu | Thr | Ser | Leu | Ala | Glu | Cys | Gln | Val | Arg | Gly | Leu | Pro | Val | |
| | 865 | | | | 870 | | | | | 875 | | | | | 880 | |
| aat | tgg | gaa | cag | gta | ttc | ctc | aac | acc | gga | gcc | cga | cgc | gtg | ccg | ctg | 2688 |
| Asn | Trp | Glu | Gln | Val | Phe | Leu | Asn | Thr | Gly | Ala | Arg | Arg | Val | Pro | Leu | |
| | | | 885 | | | | | 890 | | | | | | 895 | | |
| ccg | acc | tac | ccg | ttc | cag | cgg | cag | cgg | tac | tgg | ttg | gag | tcc | gcc | gag | 2736 |
| Pro | Thr | Tyr | Pro | Phe | Gln | Arg | Gln | Arg | Tyr | Trp | Leu | Glu | Ser | Ala | Glu | |
| | | | 900 | | | | | 905 | | | | | 910 | | | |
| tac | gac | gcg | ggc | gat | ctc | ggg | tcg | gtg | ggc | ttg | ctc | tcc | gcc | gag | cat | 2784 |
| Tyr | Asp | Ala | Gly | Asp | Leu | Gly | Ser | Val | Gly | Leu | Leu | Ser | Ala | Glu | His | |
| | | 915 | | | | | 920 | | | | | 925 | | | | |
| ccc | ctg | ctc | ggg | gct | gcg | gtg | acg | ctg | gcc | gat | gcg | ggc | ggg | ttc | ctg | 2832 |
| Pro | Leu | Leu | Gly | Ala | Ala | Val | Thr | Leu | Ala | Asp | Ala | Gly | Gly | Phe | Leu | |
| | 930 | | | | | 935 | | | | | 940 | | | | | |
| ctg | acc | ggc | aag | ctg | tcg | gtc | aag | acc | cag | ccc | tgg | ttg | gcc | gac | cac | 2880 |
| Leu | Thr | Gly | Lys | Leu | Ser | Val | Lys | Thr | Gln | Pro | Trp | Leu | Ala | Asp | His | |
| | 945 | | | | 950 | | | | 955 | | | | | | 960 | |
| gtg | gtc | ggc | ggg | gcg | atc | ctg | ctg | ccc | ggc | acc | gcg | ttc | gtg | gaa | atg | 2928 |
| Val | Val | Gly | Gly | Ala | Ile | Leu | Leu | Pro | Gly | Thr | Ala | Phe | Val | Glu | Met | |

| 965 | 970 | 975 | |
|---------------------------------|-------------------------------------|------|--|
| ctg ata cgc gcc gcg gac cag gtc | ggg tgc gat ctg atc gag gag ttg | 2976 | |
| Leu Ile Arg Ala Ala Asp Gln Val | Gly Cys Asp Leu Ile Glu Glu Leu | | |
| 980 | 985 990 | | |
| tcc ctg acg act ccg ctg gtt ttg | ccc gcg acc ggt gcg gtg cag gtg | 3024 | |
| Ser Leu Thr Thr Pro Leu Val Leu | Pro Ala Thr Gly Ala Val Gln Val | | |
| 995 | 1000 1005 | | |
| cag atc gcg gtt ggc ggt ccg gac | gag gcc ggg cgc cgc tcg gtc cgc | 3072 | |
| Gln Ile Ala Val Gly Gly Pro Asp | Glu Ala Gly Arg Arg Ser Val Arg | | |
| 1010 | 1015 1020 | | |
| gtg cat tcc tgt cga gac gac gcc | gtg ccg cag gac tcg tgg acc tgc | 3120 | |
| Val His Ser Cys Arg Asp Asp Ala | Val Pro Gln Asp Ser Trp Thr Cys | | |
| 1025 | 1030 1035 1040 | | |
| cac gcg acc ggc acg ttg acc tcc | agc gat cac cag gac gcc ggc cag | 3168 | |
| His Ala Thr Gly Thr Leu Thr Ser | Ser Ser Asp His Gln Asp Ala Gly Gln | | |
| 1045 | 1050 1055 | | |
| ggc ccc gat ggg att tgg ccg ccc | aac gat gct gtc gcg gtt ccg ctg | 3216 | |
| Gly Pro Asp Gly Ile Trp Pro Pro | Asn Asp Ala Val Ala Val Pro Leu | | |
| 1060 | 1065 1070 | | |
| gac agc ttc tac gcc cgc gca gct | gag cgg ggc ttc gat ttc ggc ccg | 3264 | |
| Asp Ser Phe Tyr Ala Arg Ala Ala | Glu Arg Gly Phe Asp Phe Gly Pro | | |
| 1075 | 1080 1085 | | |
| gcg ttc cag ggg ttg cag gcg gct | tgg aag cgc gga gac gag atc ttc | 3312 | |
| Ala Phe Gln Gly Leu Gln Ala Ala | Trp Lys Arg Gly Asp Glu Ile Phe | | |
| 1090 | 1095 1100 | | |
| gcc gag gtc ggc ctg ccc acc gca | cac cgc gaa gac gcc ggc agg ttc | 3360 | |
| Ala Glu Val Gly Leu Pro Thr Ala | His Arg Glu Asp Ala Gly Arg Phe | | |
| 1105 | 1110 1115 1120 | | |
| gga atc cac cct gct ctg ctg gat | gcg gca ctg cag gcg ctg ggc gca | 3408 | |
| Gly Ile His Pro Ala Leu Leu Asp | Ala Ala Leu Gln Ala Leu Gly Ala | | |
| 1125 | 1130 1135 | | |
| gcc gaa gag gat ccg gac gag gga | tgg ctc ccg ttc gcg tgg caa ggt | 3456 | |
| Ala Glu Glu Asp Pro Asp Glu Gly | Trp Leu Pro Phe Ala Trp Gln Gly | | |
| 1140 | 1145 1150 | | |
| gtg tcc ctc aaa gcg acg ggc gca | ctt tcc ctt cgg gtg cac ctc gtt | 3504 | |
| Val Ser Leu Lys Ala Thr Gly Ala | Leu Ser Leu Arg Val His Leu Val | | |
| 1155 | 1160 1165 | | |
| ccg gcg ggc gcg aat gcg gtg tcg | gtg ttc acg acc gac acg act ggc | 3552 | |
| Pro Ala Gly Ala Asn Ala Val Ser | Val Phe Thr Thr Asp Thr Thr Gly | | |
| 1170 | 1175 1180 | | |
| caa gcc gtg ctc tcc atc gat tcg | ctg gtg ctg cgc cag att tcg gac | 3600 | |
| Gln Ala Val Leu Ser Ile Asp Ser | Leu Val Leu Arg Gln Ile Ser Asp | | |
| 1185 | 1190 1195 1200 | | |

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|-----------------------------------------------------------------|------|
| aag cag ttg gca gcg gcc cgt gcg atg gaa cac gag tcc ctg ttc cgg | 3648 |
| Lys Gln Leu Ala Ala Arg Ala Met Glu His Glu Ser Leu Phe Arg | |
| 1205 1210 1215 | |
| gtc gac tgg aag cga atc tcg ccc ggc gct gcc aag ccg gtc tcc tgg | 3696 |
| Val Asp Trp Lys Arg Ile Ser Pro Gly Ala Ala Lys Pro Val Ser Trp | |
| 1220 1225 1230 | |
| gca gtg atc ggc aat gac gaa ctc gcc cga gcc tgc ggc tcg gca ctt | 3744 |
| Ala Val Ile Gly Asn Asp Glu Leu Ala Arg Ala Cys Gly Ser Ala Leu | |
| 1235 1240 1245 | |
| ggc acg gaa ctc cac ccc gac ctg acc ggg ttg gct gac ccg ccc ccg | 3792 |
| Gly Thr Glu Leu His Pro Asp Leu Thr Gly Leu Ala Asp Pro Pro Pro | |
| 1250 1255 1260 | |
| gac gtc gtg gtg gtg cca tgc ggt gcg tct cgc cag gac ttg gac gtt | 3840 |
| Asp Val Val Val Val Pro Cys Gly Ala Ser Arg Gln Asp Leu Asp Val | |
| 1265 1270 1275 1280 | |
| gct tcc gag gca cgt gcc gcg aca caa cgc atg ctt gac ctg atc cag | 3888 |
| Ala Ser Glu Ala Arg Ala Ala Thr Gln Arg Met Leu Asp Leu Ile Gln | |
| 1285 1290 1295 | |
| gat tgg ttg gcg gcg gcg cga ttc gcc gga tct cgc ctg gtg gtt gtg | 3936 |
| Asp Trp Leu Ala Ala Ala Arg Phe Ala Gly Ser Arg Leu Val Val Val | |
| 1300 1305 1310 | |
| acg tgt ggt gcg gcg tcg aca ggt ccc gcc gag ggt gtt tcc gac ctg | 3984 |
| Thr Cys Gly Ala Ala Ser Thr Gly Pro Ala Glu Gly Val Ser Asp Leu | |
| 1315 1320 1325 | |
| gtg cat gct gcg tcg tgg ggt ttg ttg cgt tcg gcg cag tcg gag aac | 4032 |
| Val His Ala Ala Ser Trp Gly Leu Leu Arg Ser Ala Gln Ser Glu Asn | |
| 1330 1335 1340 | |
| ccg gac cga ttc gtg ttg gtc gat gtg gac gga acc gcc gaa tca tgg | 4080 |
| Pro Asp Arg Phe Val Leu Val Asp Val Asp Gly Thr Ala Glu Ser Trp | |
| 1345 1350 1355 1360 | |
| cgt gcg ctc gcg gcg gcc gtg cgt tcc gga gaa ccg cag ctg gcg ttg | 4128 |
| Arg Ala Leu Ala Ala Ala Val Arg Ser Gly Glu Pro Gln Leu Ala Leu | |
| 1365 1370 1375 | |
| cgc gcc ggt gaa gtc cgg gtg cct cgc ctg gcg cga tgt gtt gcc gcc | 4176 |
| Arg Ala Gly Glu Val Arg Val Pro Arg Leu Ala Arg Cys Val Ala Ala | |
| 1380 1385 1390 | |
| gag gac agc cgg atc cca gtg ccc ggt gcg gat ggg acg gtg ttg att | 4224 |
| Glu Asp Ser Arg Ile Pro Val Pro Gly Ala Asp Gly Thr Val Leu Ile | |
| 1395 1400 1405 | |
| tcc ggc ggt acg ggc ctg ctg ggc ggg ttg gtt gcc cgg cat ttg gtg | 4272 |
| Ser Gly Gly Thr Gly Leu Leu Gly Gly Leu Val Ala Arg His Leu Val | |
| 1410 1415 1420 | |

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|-----------------------------------------------------------------|------|
| gcg gag cgc ggt gtc cgc cgc ctg gtg ctc gcg ggg cga cgc ggc tgg | 4320 |
| Ala Glu Arg Gly Val Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp | |
| 1425 1430 1435 1440 | |
| agc gcc ccc ggg gtc acc gac ctg gtg gat gag ttg gtg ggc ctg gga | 4368 |
| Ser Ala Pro Gly Val Thr Asp Leu Val Asp Glu Leu Val Gly Leu Gly | |
| 1445 1450 1455 | |
| gct gcg gtc gag gtg gcg agc tgc gat gtc ggg gat cgg gcc cag ttg | 4416 |
| Ala Ala Val Glu Val Ala Ser Cys Asp Val Gly Asp Arg Ala Gln Leu | |
| 1460 1465 1470 | |
| gac cgg ctg ctg acg acg atc tcg gca gag ttc ccg ctg cgc gga gtg | 4464 |
| Asp Arg Leu Leu Thr Thr Ile Ser Ala Glu Phe Pro Leu Arg Gly Val | |
| 1475 1480 1485 | |
| gtg cat gcg gcc ggg gca ctt gcc gac ggg gtc gtc gag tcg ctg aca | 4512 |
| Val His Ala Ala Gly Ala Leu Ala Asp Gly Val Val Glu Ser Leu Thr | |
| 1490 1495 1500 | |
| cca gag cac gtg gca aag gtg ttc ggc ccg aag gcc gcc ggt gcg tgg | 4560 |
| Pro Glu His Val Ala Lys Val Phe Gly Pro Lys Ala Ala Gly Ala Trp | |
| 1505 1510 1515 1520 | |
| cac ctg cac gag ttg act ctt gat ctg gat ctc tcg ttc ttc gtg ctc | 4608 |
| His Leu His Glu Leu Thr Leu Asp Leu Ser Phe Phe Val Leu | |
| 1525 1530 1535 | |
| ttc tcc tcg ttc tcc ggc gtg gcg ggg gct gcg ggt cag gga aac tac | 4656 |
| Phe Ser Ser Phe Ser Gly Val Ala Gly Ala Ala Gly Gln Gly Asn Tyr | |
| 1540 1545 1550 | |
| gcg gcg gcg aac gcg ttc ctg gac ggc ctg gct cag cac cgg cgg acg | 4704 |
| Ala Ala Ala Asn Ala Phe Leu Asp Gly Leu Ala Gln His Arg Arg Thr | |
| 1555 1560 1565 | |
| gcg ggg ctg cct gcg gtg tcg ctg gct tgg ggc ttg tgg gag cag ccc | 4752 |
| Ala Gly Leu Pro Ala Val Ser Leu Ala Trp Gly Leu Trp Glu Gln Pro | |
| 1570 1575 1580 | |
| agc ggg atg acc gga gcg ctc gat gcg gcg ggc cgt agc cgc att gcg | 4800 |
| Ser Gly Met Thr Gly Ala Leu Asp Ala Ala Gly Arg Ser Arg Ile Ala | |
| 1585 1590 1595 1600 | |
| cgc acc aat ccg ccg atg tcc gcg ccg gac ggg ttg ccg ctg ttc gag | 4848 |
| Arg Thr Asn Pro Pro Met Ser Ala Pro Asp Gly Leu Arg Leu Phe Glu | |
| 1605 1610 1615 | |
| atg gcg ttt cgc gtt ccg ggc gaa tcg ctt ctg gtt ccg gtc cac gtc | 4896 |
| Met Ala Phe Arg Val Pro Gly Glu Ser Leu Leu Val Pro Val His Val | |
| 1620 1625 1630 | |
| gac ctg aac gcc ctg cgc gct gat gcg gcc gac ggc ggt gtg cct gcg | 4944 |
| Asp Leu Asn Ala Leu Arg Ala Asp Ala Ala Asp Gly Gly Val Pro Ala | |
| 1635 1640 1645 | |
| ttg ttg cgc gac ctg gtg cca gcg ccc gtg ccg ccg agc qcq qtc aac | 4992 |

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| Leu Leu Arg Asp Leu Val Pro Ala Pro Val Arg Arg Ser Ala Val Asn | |
| 1650 1655 1660 | |
| gag tcg gcg gac gtc aac ggt ctg gtt ggt cgg ctg cgg agg ctg ccg | 5040 |
| Glu Ser Ala Asp Val Asn Gly Leu Val Gly Arg Leu Arg Arg Leu Pro | |
| 1665 1670 1675 1680 | |
| gac ctg gat cag gaa acc cag ctg ttg ggt ttg gtg cgc gag cat gtt | 5088 |
| Asp Leu Asp Gln Glu Thr Gln Leu Leu Gly Leu Val Arg Glu His Val | |
| 1685 1690 1695 | |
| tcg gcg gtg ctg ggg cat tcg ggt gcg gtc gag gtc ggg gcc gat cgt | 5136 |
| Ser Ala Val Leu Gly His Ser Gly Ala Val Glu Val Gly Ala Asp Arg | |
| 1700 1705 1710 | |
| gct ttc cgg gat ttg ggt ttt gat tcg ttg tcc ggt gtg gag ttt cgg | 5184 |
| Ala Phe Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Phe Arg | |
| 1715 1720 1725 | |
| aac cgg ctt ggc ggg gtg ctg ggc gtt cgg ttg ccg gct act gcg gtg | 5232 |
| Asn Arg Leu Gly Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val | |
| 1730 1735 1740 | |
| ttc gac tat ccg aca ccg cgg gcg ttg gtt cgg ttc ttg ctc gac aaa | 5280 |
| Phe Asp Tyr Pro Thr Pro Arg Ala Leu Val Arg Phe Leu Leu Asp Lys | |
| 1745 1750 1755 1760 | |
| ctg att ggt ggc gtg gag gct ccg act ccc gca ccg gcg gct gtg gcg | 5328 |
| Leu Ile Gly Gly Val Glu Ala Pro Thr Pro Ala Pro Ala Ala Val Ala | |
| 1765 1770 1775 | |
| gcg gtg act gct gac gat ccc gtt gtg atc gtg ggg atg ggc tgt cgt | 5376 |
| Ala Val Thr Ala Asp Asp Pro Val Val Ile Val Gly Met Gly Cys Arg | |
| 1780 1785 1790 | |
| tat ccg ggt ggg gtg tcc tcg ccg gag gag ctt tgg cgt ttg gtg gcc | 5424 |
| Tyr Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala | |
| 1795 1800 1805 | |
| ggg ggc ttg gat gcg gtg gcg gag ttc ccg gac gat cgt ggc tgg gat | 5472 |
| Gly Gly Leu Asp Ala Val Ala Glu Phe Pro Asp Asp Arg Gly Trp Asp | |
| 1810 1815 1820 | |
| cag gcg ggg ttg ttc gat ccg gat ccc gat cgt ctt ggg acc tcg tat | 5520 |
| Gln Ala Gly Leu Phe Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr | |
| 1825 1830 1835 1840 | |
| gtg tgt gag ggt ggc ttc ctg cga gat gcg gca gag ttc gat gcc ggt | 5568 |
| Val Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Gly | |
| 1845 1850 1855 | |
| ttc ttc ggg att tcc ccg cgt gag gcg ttg gcg atg gat ccg cag cag | 5616 |
| Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln | |
| 1860 1865 1870 | |
| cgg ttg ctg ctg gaa gtc gct tgg gaa acc gtg gag cgg gcg ggg att | 5664 |
| Arg Leu Leu Leu Glu Val Ala Trp Glu Thr Val Glu Arg Ala Gly Ile | |

| 1875 | 1880 | 1885 | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| gat ccg ctt tcg ttg cgg ggg agc cgg acc ggc gtg ttc gcg ggg ctg Asp Pro Leu Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu 1890 1895 1900 | | | 5712 |
| atg cac cac gac tac ggc gcg cgg ttc atc acg agg gcg ccg gag ggt Met His His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly 1905 1910 1915 1920 | | | 5760 |
| ttc gag ggt tat cta ggt aat ggc agc gcg gga ggc gtg ttt tcg ggt Phe Glu Gly Tyr Leu Gly Asn Gly Ser Ala Gly Gly Val Phe Ser Gly 1925 1930 1935 | | | 5808 |
| cgg gtt gcg tat tcg ttt ggt ttc gag ggt cct gcg gtg acg gtg gat Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp 1940 1945 1950 | | | 5856 |
| acg gcg tgt tcg tcg tcg ttg gtg gcg ctg cac ctg gcg ggt caa gca Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala 1955 1960 1965 | | | 5904 |
| ctg cgg tct ggt gag tgt gat ctg gct ctt gcg ggt ggt gtg acg gtg Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val 1970 1975 1980 | | | 5952 |
| atg gcc acg ccg ggg atg ttc gtg gag ttt tcg cgt caa ccg ggc ttg Met Ala Thr Pro Gly Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu 1985 1990 1995 2000 | | | 6000 |
| gcg gcg gat ggg ccg tgc aag tcg ttt gcg gcg gct gcg gat ggc acc Ala Ala Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr 2005 2010 2015 | | | 6048 |
| ggt tgg gga gaa ggc gcg ggc ttg gtg ttg ttg gag ccg ctg tcg gat Gly Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp 2020 2025 2030 | | | 6096 |
| gcc ccg cgc aac ggg cac gcg gtt ctg gcg gtc gtg ccg ggt agc gcg Ala Arg Arg Asn Gly His Ala Val Leu Ala Val Val Arg Gly Ser Ala 2035 2040 2045 | | | 6144 |
| gtg aat cag gat ggt gcg tcg aat ggt ttg acg gcg ccg aat ggg ccc Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro 2050 2055 2060 | | | 6192 |
| tcg cag cag ccg gtg atc acg cag gcg ttg gcg agt gct ggt ttg tcg Ser Gln Gln Arg Val Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser 2065 2070 2075 2080 | | | 6240 |
| gtg tct gat gtg gac gcc gtg gag gcg cat ggg act gga acc agg ctt Val Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu 2085 2090 2095 | | | 6288 |
| ggt gat ccg att gag gcg cag gct ctg att gcc act tac ggg cag ggg Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Gln Gly 2100 2105 2110 | | | 6336 |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| cgg gat agc gat cgg ccg ttg tgg ttg ggg tcg gtg aag tcg aat att Arg Asp Ser Asp Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile 2115 2120 2125 | 6384 |
| ggt cat acg cag gcg gcg gcg ggt gtc gct ggt gtg atc aag atg gtg Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val 2130 2135 2140 | 6432 |
| atg gcg atg cgg cac ggg cag ctg ccc gcg acg ttg cat gtg gat gaa Met Ala Met Arg His Gly Gln Leu Pro Ala Thr Leu His Val Asp Glu 2145 2150 2155 2160 | 6480 |
| cct acg tcg gaa gtg gat tgg tcg gcg ggg gat gtc cag ctc ctc acg Pro Thr Ser Glu Val Asp Trp Ser Ala Gly Asp Val Gln Leu Leu Thr 2165 2170 2175 | 6528 |
| gag aac acc ccc tgg ccc ggc aac agc cat cct cgg cgg gtg ggc gtg Glu Asn Thr Pro Trp Pro Gly Asn Ser His Pro Arg Arg Val Gly Val 2180 2185 2190 | 6576 |
| tcg tcg ttc ggg atc agc ggc acc aac gca cac gtc atc ctc gaa caa Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln 2195 2200 2205 | 6624 |
| gcc tcg aaa aca cca gac gag act gcg gac aag agc ggt ccc gat tcg Ala Ser Lys Thr Pro Asp Glu Thr Ala Asp Lys Ser Gly Pro Asp Ser 2210 2215 2220 | 6672 |
| gaa tcg acc gtg gac ctt cca gcg gtc ccg ttg atc gtg tcg ggg aga Glu Ser Thr Val Asp Leu Pro Ala Val Pro Leu Ile Val Ser Gly Arg 2225 2230 2235 2240 | 6720 |
| aca ccg gca gcg ctc agc gct cag gcg agc gca ttg ttg tcc tat ttg Thr Pro Ala Ala Leu Ser Ala Gln Ala Ser Ala Leu Leu Ser Tyr Leu 2245 2250 2255 | 6768 |
| ggt gag cgt ggc gat att tcc acg ctg gat gcg gcg ttt tcg ttg gct Gly Glu Arg Gly Asp Ile Ser Thr Leu Asp Ala Ala Phe Ser Leu Ala 2260 2265 2270 | 6816 |
| tcc tcc cgg gcc gcg ttg gag gag ccg gcg gtg gtg ctg gga gcg gac Ser Ser Arg Ala Ala Leu Glu Glu Arg Ala Val Val Leu Gly Ala Asp 2275 2280 2285 | 6864 |
| cgc gaa acg ttg ttg tcc ggg ttg gaa gcg ctg gct tcc ggt cgc gag Arg Glu Thr Leu Leu Ser Gly Leu Glu Ala Leu Ala Ser Gly Arg Glu 2290 2295 2300 | 6912 |
| gct tct ggg gtg gtg tcg gga tcc ccg gtc tct ggc ggg gtt ggg ttc Ala Ser Gly Val Val Ser Gly Ser Pro Val Ser Gly Gly Val Gly Phe 2305 2310 2315 2320 | 6960 |
| gtg ttc gcc ggt cag ggc gga cag tgg ttg ggg atg ggc cgg ggg ctc Val Phe Ala Gly Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu 2325 2330 2335 | 7008 |

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|---------------------------------------------------------------------|------|
| tac tcg gtt ttt ccg gtg ttc gct gac gcg ttt gac gaa gca tgt gcc | 7056 |
| Tyr Ser Val Phe Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala | |
| 2340 2345 2350 | |
| gga ctg gac gcg cat ctg ggg cag gac gtg ggg gtc cgg gat gtg gtg | 7104 |
| Gly Leu Asp Ala His Leu Gly Gln Asp Val Gly Val Arg Asp Val Val | |
| 2355 2360 2365 | |
| ttt ggt tcc gac ggg tcc ttg ttg gat cgg acg ctg tgg gcc cag tcg | 7152 |
| Phe Gly Ser Asp Gly Ser Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser | |
| 2370 2375 2380 | |
| ggt ttg ttc gcg ttg cag gtt ggt ttg ctg agc ctg ctg ggt tcg tgg | 7200 |
| Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Ser Leu Leu Gly Ser Trp | |
| 2385 2390 2395 2400 | |
| ggt gtc cgg ccg ggt gtg gtg ctg ggc cat tcg gtc ggc gag ttc gcg | 7248 |
| Gly Val Arg Pro Gly Val Val Leu Gly His Ser Val Gly Glu Phe Ala | |
| 2405 2410 2415 | |
| gcg gcg gtt gcg gcg gga gtg ttg tcg ttg ccg gat gcg gct cgg atg | 7296 |
| Ala Ala Val Ala Ala Ala Gly Val Leu Ser Leu Pro Asp Ala Ala Arg Met | |
| 2420 2425 2430 | |
| gtg gcg ggt cgt gcc cgg ttg atg cag gcg ttg cct tct ggc ggt gcc | 7344 |
| Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala | |
| 2435 2440 2445 | |
| atg ttg gcg gtg gct gct ggt gag gag cag ctg cgg ccg ttg ttg gcc | 7392 |
| Met Leu Ala Val Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala | |
| 2450 2455 2460 | |
| gat cgg gtt gat ggt gcg ggt atc gcc gcg gtc aac gct cct gag tcg | 7440 |
| Asp Arg Val Asp Gly Ala Gly Ile Ala Ala Val Asn Ala Pro Glu Ser | |
| 2465 2470 2475 2480 | |
| gtg gtg ctc tcc ggc gat cgg gag gtg ctt gac gac atc gcc ggc gcg | 7488 |
| Val Val Leu Ser Gly Asp Arg Glu Val Leu Asp Asp Ile Ala Gly Ala | |
| 2485 2490 2495 | |
| ctg gat ggg caa ggg att cgg tgg cgg cgg ttg cgg gtt tcg cat gcg | 7536 |
| Leu Asp Gly Gln Gly Ile Arg Trp Arg Arg Leu Arg Val Ser His Ala | |
| 2500 2505 2510 | |
| ttt cat tcg tat cgg atg gac ccg atg ttg cag gag ttc gcc gaa atc | 7584 |
| Phe His Ser Tyr Arg Met Asp Pro Met Leu Gln Glu Phe Ala Glu Ile | |
| 2515 2520 2525 | |
| gca cgc agc gtg gac tac cgg cgt ggc gac cta ccg gtc gtg tcg acg | 7632 |
| Ala Arg Ser Val Asp Tyr Arg Arg Gly Asp Leu Pro Val Val Ser Thr | |
| 2530 2535 2540 | |
| ttg acg ggt gag ctc gac acc gca ggt gtg atg gct acg ccg gag tat | 7680 |
| Leu Thr Gly Glu Leu Asp Thr Ala Gly Val Met Ala Thr Pro Glu Tyr | |
| 2545 2550 2555 2560 | |
| tgg gtg cgt cag gtt cga gag ccc gtc cgc ttc gcc gac ggc gtc cgg | 7728 |

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|-----------------------------------------------------------------|----------------|
| Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Arg | |
| 2565 | 2570 2575 |
| gtg ctc gcg cag caa ggg gtc gcc acg atc ttc gaa ctc ggc cct gat | 7776 |
| Val Leu Ala Gln Gln Gly Val Ala Thr Ile Phe Glu Leu Gly Pro Asp | |
| 2580 | 2585 2590 |
| gcg acg ctg tcg gcc ctg att ccc gat tgt cat tcg tgg gct gat cag | 7824 |
| Ala Thr Leu Ser Ala Leu Ile Pro Asp Cys His Ser Trp Ala Asp Gln | |
| 2595 | 2600 2605 |
| gcc atg ccg att ccg atg ctg cgt aaa gac cgt acg gaa acc gaa act | 7872 |
| Ala Met Pro Ile Pro Met Leu Arg Lys Asp Arg Thr Glu Thr Glu Thr | |
| 2610 | 2615 2620 |
| gtg gtc gcc gcg gtg gcg cgg gcg cac acg cgt ggt gtt ccg gtc gaa | 7920 |
| Val Val Ala Ala Val Ala Arg Ala His Thr Arg Gly Val Pro Val Glu | |
| 2625 | 2630 2635 2640 |
| tgg tcg gcg tat ttc gcc ggc acc ggg gca cgg cgg gtc gag ttg ccg | 7968 |
| Trp Ser Ala Tyr Phe Ala Gly Thr Gly Ala Arg Arg Val Glu Leu Pro | |
| 2645 | 2650 2655 |
| acg tat gcc ttc cag cgg cag cgg tac tgg ctg gaa aca tcg gat tac | 8016 |
| Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Glu Thr Ser Asp Tyr | |
| 2660 | 2665 2670 |
| ggc gat gtg acg ggt atc ggc ctg gct gcg gcg gag cat ccg ttg ctg | 8064 |
| Gly Asp Val Thr Gly Ile Gly Leu Ala Ala Ala Glu His Pro Leu Leu | |
| 2675 | 2680 2685 |
| ggg gcc gtg gtt gcg ctg gcc gat ggt gat ggg atg gtg ctg acc ggc | 8112 |
| Gly Ala Val Val Ala Leu Ala Asp Gly Asp Gly Met Val Leu Thr Gly | |
| 2690 | 2695 2700 |
| cgg ttg tcg gtg ggg acg cat ccg tgg ctg gcc cag cat cgc gtg ctg | 8160 |
| Arg Leu Ser Val Gly Thr His Pro Trp Leu Ala Gln His Arg Val Leu | |
| 2705 | 2710 2715 2720 |
| ggc gag gtc gtc gtc ccc ggc acc gcc atc ctg gag atg gcc ctg cac | 8208 |
| Gly Glu Val Val Val Pro Gly Thr Ala Ile Leu Glu Met Ala Leu His | |
| 2725 | 2730 2735 |
| gca ggg gcg cgt ctc ggc tgt gac cgg gtg gaa gag ctc acc ctg gaa | 8256 |
| Ala Gly Ala Arg Leu Gly Cys Asp Arg Val Glu Glu Leu Thr Leu Glu | |
| 2740 | 2745 2750 |
| aca ccg ctg gtg gtc ccc gaa cgc gcg gcg ggt gcc ggt agt cgt ggc | 8304 |
| Thr Pro Leu Val Val Pro Glu Arg Ala Ala Gly Ala Gly Ser Arg Gly | |
| 2755 | 2760 2765 |
| cct gcg gga ggg acc aca gtt tca att gaa act gcg gaa gaa cgt gtg | 8352 |
| Pro Ala Gly Gly Thr Thr Val Ser Ile Glu Thr Ala Glu Glu Arg Val | |
| 2770 | 2775 2780 |
| cgg acg aac gac gcc atc gaa atc cag ctg ctg gtg aac gca ccc gac | 8400 |
| Arg Thr Asn Asp Ala Ile Glu Ile Gln Leu Leu Val Asn Ala Pro Asp | |

| 2785 | 2790 | 2795 | 2800 | |
|-----------------------------------------------------------------|------|------|------|------|
| gaa ggc ggt cgg cga agg gtg tcg ctg tat tcc cgc ccg gcc ggt ggg | | | | 8448 |
| Glu Gly Gly Arg Arg Val Ser Leu Tyr Ser Arg Pro Ala Gly Gly | 2805 | 2810 | 2815 | |
| tcg aga ggt ggg ggt tgg acg cgc cac gcc acc ggc gaa ctc gtc gtc | | | | 8496 |
| Ser Arg Gly Gly Gly Trp Thr Arg His Ala Thr Gly Glu Leu Val Val | 2820 | 2825 | 2830 | |
| ggc acc acc ggt ggt agg gcg gtt cct gat tgg tcg gct gag ggt gcc | | | | 8544 |
| Gly Thr Thr Gly Gly Arg Ala Val Pro Asp Trp Ser Ala Glu Gly Ala | 2835 | 2840 | 2845 | |
| gag tcg att gct ctc gat gag ttc tac gtc gct ctg gcc gga aac ggg | | | | 8592 |
| Glu Ser Ile Ala Leu Asp Glu Phe Tyr Val Ala Leu Ala Gly Asn Gly | 2850 | 2855 | 2860 | |
| ttc gag tac ggg ccg ttg ttc cag ggg ctt cag gcg gca tgg cgt cgt | | | | 8640 |
| Phe Glu Tyr Gly Pro Leu Phe Gln Gly Leu Gln Ala Ala Trp Arg Arg | 2865 | 2870 | 2875 | 2880 |
| ggc gac gag gtt ctc gcc gaa atc gcc ccg ccg gcc gag gcc gat gcg | | | | 8688 |
| Gly Asp Glu Val Leu Ala Glu Ile Ala Pro Pro Ala Glu Ala Asp Ala | 2885 | 2890 | 2895 | |
| atg gcg tcg gga tac ctg ctc gac cca gcg ttg ctg gat gcc gcg ctg | | | | 8736 |
| Met Ala Ser Gly Tyr Leu Leu Asp Pro Ala Leu Leu Asp Ala Ala Leu | 2900 | 2905 | 2910 | |
| cag gcg tcc gcg ctc ggc gac cgc ccg gag caa ggc ggc gcg tgg ctg | | | | 8784 |
| Gln Ala Ser Ala Leu Gly Asp Arg Pro Glu Gln Gly Gly Ala Trp Leu | 2915 | 2920 | 2925 | |
| ccg ttc tca ttc acc ggc gtc gaa ctt tcc gct ccg gca ggg acg atc | | | | 8832 |
| Pro Phe Ser Phe Thr Gly Val Glu Leu Ser Ala Pro Ala Gly Thr Ile | 2930 | 2935 | 2940 | |
| agc agg gtg cgg ctg gag acc agg cga ccc gac gcg ata tcg gtg gcc | | | | 8880 |
| Ser Arg Val Arg Leu Glu Thr Arg Arg Pro Asp Ala Ile Ser Val Ala | 2945 | 2950 | 2955 | 2960 |
| gtg atg gat gag agt ggg cgg ttg ctc gcc tcg atc gat tct ctc agg | | | | 8928 |
| Val Met Asp Glu Ser Gly Arg Leu Leu Ala Ser Ile Asp Ser Leu Arg | 2965 | 2970 | 2975 | |
| cta cga agc gtg tcg tcg gga cag ctg gcg aat cgg gac gct gtc cgc | | | | 8976 |
| Leu Arg Ser Val Ser Ser Gly Gln Leu Ala Asn Arg Asp Ala Val Arg | 2980 | 2985 | 2990 | |
| gac gcg ctg ttc gag gtg acc tgg gag ccg gtg gcg acg cag tcg acg | | | | 9024 |
| Asp Ala Leu Phe Glu Val Thr Trp Glu Pro Val Ala Thr Gln Ser Thr | 2995 | 3000 | 3005 | |
| gaa ccg ggt cgc tgg gcc ctg ctt ggt gat act gcc tgc ggt aaa gac | | | | 9072 |
| Glu Pro Gly Arg Trp Ala Leu Gly Asp Thr Ala Cys Gly Lys Asp | 3010 | 3015 | 3020 | |

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|------------------------------------------------------------------------------------|------|
| gat ctc atc aaa ctc gca acg gat tcc gcc gac cgc tgc gcg gat ctg | 9120 |
| Asp Leu Ile Lys Leu Ala Thr Asp Ser Ala Asp Arg Cys Ala Asp Leu | |
| 3025 3030 3035 3040 | |
| gcg gcg cta gcc gag aaa ctt gat tcc agc gcg ctg gtt cct gat gtc | 9168 |
| Ala Ala Leu Ala Glu Lys Leu Asp Ser Ser Ala Leu Val Pro Asp Val | |
| 3045 3050 3055 | |
| gtg gtc tac tgc gcc gga gaa cag gcg gat ccc ggc acc ggc gca gcc | 9216 |
| Val Val Tyr Cys Ala Gly Glu Gln Ala Asp Pro Gly Thr Gly Ala Ala | |
| 3060 3065 3070 | |
| gca ctt gcg gag acc cag cag acg ttg gct ctg ctc caa gcg tgg ttg | 9264 |
| Ala Leu Ala Glu Thr Gln Gln Thr Leu Ala Leu Leu Gln Ala Trp Leu | |
| 3075 3080 3085 | |
| gct gag ccg cgg ttg gcc gag gca cgt ctg gtg gtg gtg acg tgt gca | 9312 |
| Ala Glu Pro Arg Leu Ala Glu Ala Arg Leu Val Val Val Thr Cys Ala | |
| 3090 3095 3100 | |
| gcg gtg acg acg gct ccg agt gac ggt gca tca gag ctg gca cat gcg | 9360 |
| Ala Val Thr Thr Ala Pro Ser Asp Gly Ala Ser Glu Leu Ala His Ala | |
| 3105 3110 3115 3120 | |
| ccg ttg tgg ggg ttg ttg cgt gcc gcg cag gtg gag aac ccg ggg cag | 9408 |
| Pro Leu Trp Gly Leu Leu Arg Ala Ala Gln Val Glu Asn Pro Gly Gln | |
| 3125 3130 3135 | |
| ttt gtg ctg gcg gac gtc gac gga acc gcc gaa tcg tgg cgt gcg ttg | 9456 |
| Phe Val Leu Ala Asp Val Asp Gly Thr Ala Glu Ser Trp Arg Ala Leu | |
| 3140 3145 3150 | |
| ccg agt gcg ttg ggc tcg atg gaa ccg cag ttg gcc ctg ccg aag ggc | 9504 |
| Pro Ser Ala Leu Gly Ser Met Glu Pro Gln Leu Ala Leu Arg Lys Gly | |
| 3155 3160 3165 | |
| gcg gtg cga gcg ccc cgc ttg gct tcg gtc gcc ggg cag atc gac gtg | 9552 |
| Ala Val Arg Ala Pro Arg Leu Ala Ser Val Ala Gly Gln Ile Asp Val | |
| 3170 3175 3180 | |
| ccc gcg gtt gtg gcg gat ccc gac cga acc gtg ctg att tcg ggc ggc | 9600 |
| Pro Ala Val Val Ala Asp Pro Asp Arg Thr Val Leu Ile Ser Gly Gly | |
| 3185 3190 3195 3200 | |
| acg ggc ctg ttg ggg ggc gcg gtt gcc cgc cac ctg gtg acc gaa cgc | 9648 |
| Thr Gly Leu Leu Gly Gly Ala Val Ala Arg His Leu Val Thr Glu Arg | |
| 3205 3210 3215 | |
| ggt gtc cgc cga ttg gtg ttg acg ggc cgt cgt ggc tgg gat gct cct | 9696 |
| Gly Val Arg Arg Leu Val Leu Thr Gly Arg Arg Gly Trp Asp Ala Pro | |
| 3220 3225 3230 | |
| gga atc acc gag ttg gtg ggt gag ctg aac ggc ctc ggt gcc gtg gtc | 9744 |
| Gly Ile Thr Glu Leu Val Gly Glu Leu Asn Gly Leu Gly Ala Val Val | |
| 3235 3240 3245 | |

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|-----------------------------------------------------------------|-------|
| gac gtg gtg gcg tgc gac gtc gcg gat cgt gct gat ctg gag tgc ttg | 9792 |
| Asp Val Val Ala Cys Asp Val Ala Asp Arg Ala Asp Leu Glu Ser Leu | |
| 3250 3255 3260 | |
| ctg gcg gcg gtc ccg gcg gaa ttt ccg ttg tgc ggc gtg gtg cat gcc | 9840 |
| Leu Ala Ala Val Pro Ala Glu Phe Pro Leu Cys Gly Val Val His Ala | |
| 3265 3270 3275 3280 | |
| gcg ggg gcg ctg gcc gac ggg gtg atc gag tgc ttg tca ccg gac gac | 9888 |
| Ala Gly Ala Leu Ala Asp Gly Val Ile Glu Ser Leu Ser Pro Asp Asp | |
| 3285 3290 3295 | |
| gtg gga gcg gtg ttc ggc ccg aag gcg gcg ggg gcg tgg aat ctg cac | 9936 |
| Val Gly Ala Val Phe Gly Pro Lys Ala Ala Gly Ala Trp Asn Leu His | |
| 3300 3305 3310 | |
| gag ctg act cgt gat acg gac ctg tgc ttc ttc gcg ttg ttc tcc tgc | 9984 |
| Glu Leu Thr Arg Asp Thr Asp Leu Ser Phe Phe Ala Leu Phe Ser Ser | |
| 3315 3320 3325 | |
| ctt tcc ggt gtt gcc ggc gct cct ggt cag ggc aat tat gcg gcg gcg | 10032 |
| Leu Ser Gly Val Ala Gly Ala Pro Gly Gln Gly Asn Tyr Ala Ala Ala | |
| 3330 3335 3340 | |
| aac gcg ttc ctg gac gca ttg gcg cat tac cgg cgg tca cag gga ctg | 10080 |
| Asn Ala Phe Leu Asp Ala Leu Ala His Tyr Arg Arg Ser Gln Gly Leu | |
| 3345 3350 3355 3360 | |
| cct gcg gtg tgc ctg gcc tgg ggc ctg tgg gag cag ccg agc ggg atg | 10128 |
| Pro Ala Val Ser Leu Ala Trp Gly Leu Trp Glu Gln Pro Ser Gly Met | |
| 3365 3370 3375 | |
| acg gag acg ctc agc gag gtc gac cgg agc agg atc gcg cgc gcc aac | 10176 |
| Thr Glu Thr Leu Ser Glu Val Asp Arg Ser Arg Ile Ala Arg Ala Asn | |
| 3380 3385 3390 | |
| ccg ccg ttg tcc acc aag gag gga ttg cgg ctg ttc gat gcc ggg ctg | 10224 |
| Pro Pro Leu Ser Thr Lys Glu Gly Leu Arg Leu Phe Asp Ala Gly Leu | |
| 3395 3400 3405 | |
| gcg ctg gac cgg gca gcg gta gtt ccg gcg aag ttg gac agg act ttc | 10272 |
| Ala Leu Asp Arg Ala Ala Val Val Pro Ala Lys Leu Asp Arg Thr Phe | |
| 3410 3415 3420 | |
| ctg gcc gag cag gcg cgg tgc ggc tgc ctg ccc gca ttg ttg acg gca | 10320 |
| Leu Ala Glu Gln Ala Arg Ser Gly Ser Leu Pro Ala Leu Leu Thr Ala | |
| 3425 3430 3435 3440 | |
| ctg gta ccc ccc atc cgt cgt aat agg cgg gct agc gga acc gag ctc | 10368 |
| Leu Val Pro Pro Ile Arg Arg Asn Arg Arg Ala Ser Gly Thr Glu Leu | |
| 3445 3450 3455 | |
| gcg gac gag ggc acc ctg ctc ggg gtg gtg cgg gag cat gcc gcg gcc | 10416 |
| Ala Asp Glu Gly Thr Leu Leu Gly Val Val Arg Glu His Ala Ala Ala | |
| 3460 3465 3470 | |
| gtg ctg ggg tat tgc agc gcg gct gac gtc ggg gtc gag cgc gct ttc | 10464 |

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|-----------------------------------------------------------------|-------|
| Val Leu Gly Tyr Ser Ser Ala Ala Asp Val Gly Val Glu Arg Ala Phe | |
| 3475 3480 3485 | |
| cgg gat ctg ggt ttt gat tcg ttg tct ggt gtg gag ttg cgg aac cgc | 10512 |
| Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Leu Arg Asn Arg | |
| 3490 3495 3500 | |
| ctt gcc ggg gtg ctg ggg gtg cgg ttg ccg gcg act gcg gtg ttc gac | 10560 |
| Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val Phe Asp | |
| 3505 3510 3515 3520 | |
| tat ccg acg ccg agg gcg ctg gcc cgg ttc ctg cac cag gaa ctg gca | 10608 |
| Tyr Pro Thr Pro Arg Ala Leu Ala Arg Phe Leu His Gln Glu Leu Ala | |
| 3525 3530 3535 | |
| gac gag atc gct acg acg cca gcg ccg gtg acg acg acc agg gca ccg | 10656 |
| Asp Glu Ile Ala Thr Thr Pro Ala Pro Val Thr Thr Thr Arg Ala Pro | |
| 3540 3545 3550 | |
| gtc gcc gaa gac gat ctc gtc gcg ata gtc ggg atg gga tgc cgt ttt | 10704 |
| Val Ala Glu Asp Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe | |
| 3555 3560 3565 | |
| ccc ggt cag gtg tcc tcg ccg gag gag ctc tgg cgt ttg gtg gcc ggg | 10752 |
| Pro Gly Gln Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly | |
| 3570 3575 3580 | |
| ggc gtg gat gcg gtc gcg gac ttc cca gcc gat cgc ggc tgg gat ctg | 10800 |
| Gly Val Asp Ala Val Ala Asp Phe Pro Ala Asp Arg Gly Trp Asp Leu | |
| 3585 3590 3595 3600 | |
| gca ggc ttg ttc gat ccg gac ccg gaa cgg gct ggg aag acc tac gtg | 10848 |
| Ala Gly Leu Phe Asp Pro Asp Pro Glu Arg Ala Gly Lys Thr Tyr Val | |
| 3605 3610 3615 | |
| cgg gaa ggg gcc ttc ctc acc gac gcc gat cgg ttc gat gcg ggt ttc | 10896 |
| Arg Glu Gly Ala Phe Leu Thr Asp Ala Asp Arg Phe Asp Ala Gly Phe | |
| 3620 3625 3630 | |
| ttc ggg att tcc ccg cgt gag gcg ttg gcg atg gat ccg cag caa cgg | 10944 |
| Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg | |
| 3635 3640 3645 | |
| ctg ttg ctg gag ctg tcc tgg gag gcc att gaa cgg gca ggg atc gat | 10992 |
| Leu Leu Leu Glu Leu Ser Trp Glu Ala Ile Glu Arg Ala Gly Ile Asp | |
| 3650 3655 3660 | |
| ccg ggt tcg ctg agg ggg agt cgg acc ggt gtg ttc gcg ggg ctg atg | 11040 |
| Pro Gly Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met | |
| 3665 3670 3675 3680 | |
| tac cac gac tat ggc gcc cgg ttc gcc agc cga gcc ccg gaa ggt ttc | 11088 |
| Tyr His Asp Tyr Gly Ala Arg Phe Ala Ser Arg Ala Pro Glu Gly Phe | |
| 3685 3690 3695 | |
| gag ggg tat ctc ggc aat ggc agt gct ggg agt gtc gcg tcg ggc cgg | 11136 |
| Glu Gly Tyr Leu Gly Asn Gly Ser Ala Gly Ser Val Ala Ser Gly Arg | |

| 3700 | 3705 | 3710 | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-------|
| att gcg tac tcg ttt ggt ttc gag ggt cct gcg gtg acg gtg gat act Ile Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr 3715 3720 3725 | | | 11184 |
| gcg tgt tcg tcg tcg ttg gtg gcg ttg cat ttg gcg ggt cag tcg ttg Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ser Leu 3730 3735 3740 | | | 11232 |
| cgt tcc ggc gaa tgc gat ctc gcc ctt gcc ggt ggt gtg acg gtg atg Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met 3745 3750 3755 3760 | | | 11280 |
| tcg acg ccc ggg acg ttt gtg gaa ttc tcc cgt cag cgg ggc ctg gca Ser Thr Pro Gly Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala 3765 3770 3775 | | | 11328 |
| ccg gac ggg cgg tgc aag tcg ttc gcg gag agc gcg gac ggt acc ggt Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala Asp Gly Thr Gly 3780 3785 3790 | | | 11376 |
| tgg ggt gag ggt gct ggt ttg gtg ttg ttg gag cgg ttg tcg gat gct Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala 3795 3800 3805 | | | 11424 |
| cgg cgg aat ggg cat cgg gtg ttg gcg gtg gtt cgt ggg tcg gcg gtg Arg Arg Asn Gly His Arg Val Leu Ala Val Val Arg Gly Ser Ala Val 3810 3815 3820 | | | 11472 |
| aat cag gat ggt gcg tcg aat ggc ttg acc gcg ccg aat ggt ccc tcg Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser 3825 3830 3835 3840 | | | 11520 |
| cag cag cgg gtc atc cag cag gcg ttg gcg agt gcg ggt ctg tcg gtg Gln Gln Arg Val Ile Gln Gln Ala Leu Ala Ser Ala Gly Leu Ser Val 3845 3850 3855 | | | 11568 |
| tcc gat gtg gat gcc gtg gag gcg cat ggg acc ggg acc agg ttg ggt Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly 3860 3865 3870 | | | 11616 |
| gat ccg att gag gcg cag gct ctg att gct acg tat ggg cgc gat cgt Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg 3875 3880 3885 | | | 11664 |
| gat ccc ggt cgg ccg ttg tgg ttg ggg tcg gtg aag tcc aac atc ggt Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly 3890 3895 3900 | | | 11712 |
| cat acg cag gcg gcg gcg ggt gtt gcc ggt gtg atc aag atg gtg atg His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met 3905 3910 3915 3920 | | | 11760 |
| gcg atg cgg cac ggg caa ctt ccg cgc acg ctg cac gtg gat gca ccc Ala Met Arg His Gly Gln Leu Pro Arg Thr Leu His Val Asp Ala Pro 3925 3930 3935 | | | 11808 |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| tcc tcg cag gtg gat tgg tcg gcg ggg agg gtc cag ctc ctg acg gag Ser Ser Gln Val Asp Trp Ser Ala Gly Arg Val Gln Leu Leu Thr Glu 3940 3945 3950 | 11856 |
| aac acg ccc tgg ccc gac agt ggt cgc ccc tgt cgg gtg ggg gtg tcg Asn Thr Pro Trp Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser 3955 3960 3965 | 11904 |
| tcg ttc ggg atc agc ggc acc aac gcg cac gtc atc ctg gaa cag tcc Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser 3970 3975 3980 | 11952 |
| acg ggg cag atg gat cag gca gcg gag ccg gat tcg agt cct gtt ctg Thr Gly Gln Met Asp Gln Ala Ala Glu Pro Asp Ser Ser Pro Val Leu 3985 3990 3995 4000 | 12000 |
| gat gtt ccg gtg gtg ccg tgg gtg gtg tcg ggc aaa aca ccc gaa gcg Asp Val Pro Val Val Pro Trp Val Val Ser Gly Lys Thr Pro Glu Ala 4005 4010 4015 | 12048 |
| cta tcc gcc cag gcg gca acg ttg gcg acc tat ttg gac caa aat gtt Leu Ser Ala Gln Ala Ala Thr Leu Ala Thr Tyr Leu Asp Gln Asn Val 4020 4025 4030 | 12096 |
| gat gtc tcc cct ctg gac gtt ggg att tcg ctt gcg gtg acc cgt tcg Asp Val Ser Pro Leu Asp Val Gly Ile Ser Leu Ala Val Thr Arg Ser 4035 4040 4045 | 12144 |
| gcg ctg gat gag cgg gcg gtg gtg ctg ggg tcg gat cgt gac acg ttg Ala Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Asp Thr Leu 4050 4055 4060 | 12192 |
| ttg tct ggc ctg aat gcg ctg gct gcc ggt cat gag gct gct ggc gtg Leu Ser Gly Leu Asn Ala Leu Ala Ala Gly His Glu Ala Ala Gly Val 4065 4070 4075 4080 | 12240 |
| gtt acg gga cct gtc ggg att ggt ggc cgg acc ggg ttt gtg ttc gcc Val Thr Gly Pro Val Gly Ile Gly Gly Arg Thr Gly Phe Val Phe Ala 4085 4090 4095 | 12288 |
| ggt caa ggc ggt cag tgg ttg ggg atg ggc cgc cgg ttg tac tcg gag Gly Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Arg Leu Tyr Ser Glu 4100 4105 4110 | 12336 |
| ttt ccg gcg ttc gcc ggt gct ttc gac gaa gca tgc gcc gag ctc gat Phe Pro Ala Phe Ala Gly Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp 4115 4120 4125 | 12384 |
| gcg aac ctg ggg agg gaa gtc ggg gtt cgg gat gtg gtg ttc ggc tcc Ala Asn Leu Gly Arg Glu Val Gly Val Arg Asp Val Val Phe Gly Ser 4130 4135 4140 | 12432 |
| gac gag tcc ttg ctg gat cgg act ttg tgg gcg cag tcg ggt ttg ttc Asp Glu Ser Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser Gly Leu Phe 4145 4150 4155 4160 | 12480 |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| gcg ttg cag gtc ggt ctc tgg gaa ttg ttg ggt acg tgg ggt gtt cgg Ala Leu Gln Val Gly Leu Trp Glu Leu Leu Gly Thr Trp Gly Val Arg 4165 4170 4175 | 12528 |
| ccc agc gta gtg ctg ggg cat tcg gtc ggg gag cta gcc gcg gcg ttc Pro Ser Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe 4180 4185 4190 | 12576 |
| gcc gca ggt gtg ctg tcg atg gcg gag gcg gct cgg ctg gtg gcg ggt Ala Ala Gly Val Leu Ser Met Ala Glu Ala Ala Arg Leu Val Ala Gly 4195 4200 4205 | 12624 |
| cgt gcg cgg ttg atg cag gcg ttg cct tct ggc ggt gcc atg ctg gcg Arg Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala Met Leu Ala 4210 4215 4220 | 12672 |
| gtg tcc gcg acc gag gcc cga gtc ggc ccg ctg ctc gat ggg gtg cgg Val Ser Ala Thr Glu Ala Arg Val Gly Pro Leu Leu Asp Gly Val Arg 4225 4230 4235 4240 | 12720 |
| gat cgt gtt ggt gtc gca gcg gtt aac gct ccg ggg tcg gtg gtg ctt Asp Arg Val Gly Val Ala Ala Val Asn Ala Pro Gly Ser Val Val Leu 4245 4250 4255 | 12768 |
| tcc ggt gac cgg gat gtg ctc gat ggc att gcc ggt cgg ctg gac ggg Ser Gly Asp Arg Asp Val Leu Asp Gly Ile Ala Gly Arg Leu Asp Gly 4260 4265 4270 | 12816 |
| caa ggt atc cgg tcg agg tgg ttg cgg gtt tcg cac gcg ttt cat tcg Gln Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser 4275 4280 4285 | 12864 |
| cat cgg atg gat ccg atg ctg gcg gag ttc gcc gag ctc gca cgg agc His Arg Met Asp Pro Met Leu Ala Glu Phe Ala Glu Leu Ala Arg Ser 4290 4295 4300 | 12912 |
| gtg gac tac cgg tct cca cgg ctg ccg att gtc tcg acg ctg acc gga Val Asp Tyr Arg Ser Pro Arg Leu Pro Ile Val Ser Thr Leu Thr Gly 4305 4310 4315 4320 | 12960 |
| aac ctc gat gac gtg ggc gtg atg gct acg ccg gag tat tgg gtg cgc Asn Leu Asp Asp Val Gly Val Met Ala Thr Pro Glu Tyr Trp Val Arg 4325 4330 4335 | 13008 |
| cag gtg cga gag ccc gtc cgc ttc gcc gac ggt gtc cag gcg ctt gtg Gln Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Gln Ala Leu Val 4340 4345 4350 | 13056 |
| gac caa ggc gtc gac acg att gtg gaa ctc ggt ccg gac ggg gcg ttg Asp Gln Gly Val Asp Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu 4355 4360 4365 | 13104 |
| tcg agc ttg gtt caa gag tgt gtg gcg gag tcc ggg cgg gcg acg ggg Ser Ser Leu Val Gln Glu Cys Val Ala Glu Ser Gly Arg Ala Thr Gly 4370 4375 4380 | 13152 |
| att ccg ttg gtg cgg aga gac cgt gat gag gtc cga acg gtg ctg gac | 13200 |

| | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Ile | Pro | Leu | Val | Arg | Arg | Asp | Arg | Asp | Glu | Val | Arg | Thr | Val | Leu | Asp | |
| 4385 | | | | | | 4390 | | | | 4395 | | | | | 4400 | |
| gct | ttg | gcg | cag | acc | cac | act | cgt | ggt | ggc | gcg | gtg | gac | tgg | ggg | tca | 13248 |
| Ala | Leu | Ala | Gln | Thr | His | Thr | Arg | Gly | Gly | Ala | Val | Asp | Trp | Gly | Ser | |
| | | | | 4405 | | | | | 4410 | | | | | 4415 | | |
| ttt | ttc | gct | ggt | acg | agg | gca | acg | caa | gtc | gac | ctt | ccc | acg | tat | gcc | 13296 |
| Phe | Phe | Ala | Gly | Thr | Arg | Ala | Thr | Gln | Val | Asp | Leu | Pro | Thr | Tyr | Ala | |
| | | | 4420 | | | | | 4425 | | | | 4430 | | | | |
| ttc | caa | cga | cag | cgg | tac | tgg | ctg | gag | cca | tcg | gat | tcc | ggt | gat | gtg | 13344 |
| Phe | Gln | Arg | Gln | Arg | Tyr | Trp | Leu | Glu | Pro | Ser | Asp | Ser | Gly | Asp | Val | |
| | | 4435 | | | | | 4440 | | | | | 4445 | | | | |
| acc | ggt | gtt | ggc | ctg | acc | ggg | gcg | gag | cat | ccg | ctg | ttg | ggt | gcc | gtg | 13392 |
| Thr | Gly | Val | Gly | Leu | Thr | Gly | Ala | Glu | His | Pro | Leu | Leu | Gly | Ala | Val | |
| | 4450 | | | | | 4455 | | | | | 4460 | | | | | |
| gtg | ccg | gtc | gcg | ggc | ggc | gat | gag | gtg | ctg | ctg | acc | ggc | agg | ctg | tcg | 13440 |
| Val | Pro | Val | Ala | Gly | Gly | Asp | Glu | Val | Leu | Leu | Thr | Gly | Arg | Leu | Ser | |
| 4465 | | | | | 4470 | | | | 4475 | | | | | | 4480 | |
| gtg | ggg | acg | cat | ccg | tgg | ctg | gcg | gaa | cac | cgc | gtg | ctg | ggc | gaa | gtc | 13488 |
| Val | Gly | Thr | His | | Pro | Trp | Leu | Ala | Glu | His | Arg | Val | Leu | Gly | Glu | |
| | | | | 4485 | | | | 4490 | | | | | | 4495 | | |
| gtc | gtc | ccc | ggc | acc | gcg | ttg | ctg | gag | atg | gcg | tgg | cgg | gcc | ggt | agc | 13536 |
| Val | Val | Pro | Gly | Thr | Ala | Leu | Leu | Glu | Met | Ala | Trp | Arg | Ala | Gly | Ser | |
| | | | 4500 | | | | | 4505 | | | | | 4510 | | | |
| cag | gtc | ggt | tgt | gaa | cgt | gtg | gag | gag | ctc | acc | ttg | gag | gca | ccg | ctg | 13584 |
| Gln | Val | Gly | Cys | Glu | Arg | Val | Glu | Glu | Leu | Thr | Leu | Glu | Ala | Pro | Leu | |
| | | 4515 | | | | | 4520 | | | | | 4525 | | | | |
| gtc | ctg | ccg | gag | cgg | ggc | gct | gcg | gcg | gtg | cag | ttg | gcg | gtg | ggg | gct | 13632 |
| Val | Leu | Pro | Glu | Arg | Gly | Ala | Ala | Ala | Val | Gln | Leu | Ala | Val | Gly | Ala | |
| | 4530 | | | | | 4535 | | | | 4540 | | | | | | |
| ccg | gat | gag | gcc | ggc | cgg | cgc | agt | ttg | cag | ctc | tat | tcc | cga | ggc | gct | 13680 |
| Pro | Asp | Glu | Ala | Gly | Arg | Arg | Ser | Leu | Gln | Leu | Tyr | Ser | Arg | Gly | Ala | |
| 4545 | | | | | 4550 | | | | 4555 | | | | | | 4560 | |
| gat | gaa | gac | ggc | gac | tgg | cgg | cgg | att | gcc | tcc | ggg | ctg | ttg | gcc | cag | 13728 |
| Asp | Glu | Asp | Gly | Asp | Trp | Arg | Arg | Ile | Ala | Ser | Gly | Leu | Leu | Ala | Gln | |
| | | | | 4565 | | | | 4570 | | | | | | 4575 | | |
| gcc | aat | gcg | gtg | ccg | ccg | gcg | gat | tcg | acg | gca | tgg | ccg | ccg | gac | ggc | 13776 |
| Ala | Asn | Ala | Val | Pro | Pro | Ala | Asp | Ser | Thr | Ala | Trp | Pro | Pro | Asp | Gly | |
| | | | 4 | | | | | | | | | | | | | |

| 4610 | 4615 | 4620 | |
|-----------------------------------------------------------------|------|------|-------|
| cac ggc gac gat atc ttc gcc gaa ttg gcc ggg tca cca gac gcc tcg | | | 13920 |
| His Gly Asp Asp Ile Phe Ala Glu Leu Ala Gly Ser Pro Asp Ala Ser | | | |
| 4625 | 4630 | 4635 | 4640 |
| ggc ttc ggc atc cac ccg gcg ctg ctg gac gct gca ctg cac gcg atg | | | 13968 |
| Gly Phe Gly Ile His Pro Ala Leu Leu Asp Ala Ala Leu His Ala Met | | | |
| 4645 | 4650 | 4655 | |
| gcg ctt ggt gct tcg ccc gac tcg gaa gcg cgt ctg ccg ttt tcc tgg | | | 14016 |
| Ala Leu Gly Ala Ser Pro Asp Ser Glu Ala Arg Leu Pro Phe Ser Trp | | | |
| 4660 | 4665 | 4670 | |
| cgt ggc gcc cag ctg tac cgc gct gaa gga gca gcg ctt cgg gta cgg | | | 14064 |
| Arg Gly Ala Gln Leu Tyr Arg Ala Glu Gly Ala Ala Leu Arg Val Arg | | | |
| 4675 | 4680 | 4685 | |
| ctc tcg ccg ctg ggc tcc ggt gca gtc tca ttg acg ttg gtg gat gcc | | | 14112 |
| Leu Ser Pro Leu Gly Ser Gly Ala Val Ser Leu Thr Leu Val Asp Ala | | | |
| 4690 | 4695 | 4700 | |
| aca ggg cga cga gtc gct gcg gtg gaa tcg ctt tcg acg cga ccg gtc | | | 14160 |
| Thr Gly Arg Arg Val Ala Ala Val Glu Ser Leu Ser Thr Arg Pro Val | | | |
| 4705 | 4710 | 4715 | 4720 |
| tcc acc gac cag atc ggt gcc ggt cgc ggc gat caa gag cgg ctg ctg | | | 14208 |
| Ser Thr Asp Gln Ile Gly Ala Gly Arg Gly Asp Gln Glu Arg Leu Leu | | | |
| 4725 | 4730 | 4735 | |
| cac gtc gag tgg gta agg tcg gct gaa tct gcg ggg atg tct ctg acc | | | 14256 |
| His Val Glu Trp Val Arg Ser Ala Glu Ser Ala Gly Met Ser Leu Thr | | | |
| 4740 | 4745 | 4750 | |
| tcc tgc gcg gtg gtc ggt ttg ggc gaa ccg gag tgg cac gct gcg ctg | | | 14304 |
| Ser Cys Ala Val Val Gly Leu Gly Glu Pro Glu Trp His Ala Ala Leu | | | |
| 4755 | 4760 | 4765 | |
| aag acc act ggt gtc caa gtc gag tcc cat gcg gac ctt gct tcg ttg | | | 14352 |
| Lys Thr Thr Gly Val Gln Val Glu Ser His Ala Asp Leu Ala Ser Leu | | | |
| 4770 | 4775 | 4780 | |
| gcc acc gag gtt gcc aag ccg ggt tca gct cct ggt gcg gtc atc gtc | | | 14400 |
| Ala Thr Glu Val Ala Lys Arg Gly Ser Ala Pro Gly Ala Val Ile Val | | | |
| 4785 | 4790 | 4795 | 4800 |
| ccg tgc ccg cga ccc cga gcg atg cag gag ctg ccg acc gcc gcg cga | | | 14448 |
| Pro Cys Pro Arg Pro Arg Ala Met Gln Glu Leu Pro Thr Ala Ala Arg | | | |
| 4805 | 4810 | 4815 | |
| agg gcg acg caa cag gcg atg gcg atg ctg cag caa tgg ctt gcc gat | | | 14496 |
| Arg Ala Thr Gln Gln Ala Met Ala Met Leu Gln Gln Trp Leu Ala Asp | | | |
| 4820 | 4825 | 4830 | |
| gac ccg ttc gtc agt acg cgc ctg atc ctg ctg acg cat ccg gcg gtc | | | 14544 |
| Asp Arg Phe Val Ser Thr Arg Leu Ile Leu Leu Thr His Arg Ala Val | | | |
| 4835 | 4840 | 4845 | |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| tcc gca gtt gct gga gaa gac gtg ctc gac ctg gta cac gcg ccg ctg Ser Ala Val Ala Gly Glu Asp Val Leu Asp Leu Val His Ala Pro Leu 4850 4855 4860 | 14592 |
| tgg ggc ttg gtc cgc agc gcg caa gcg gag cac ccg gac cga ttc gcc Trp Gly Leu Val Arg Ser Ala Gln Ala Glu His Pro Asp Arg Phe Ala 4865 4870 4875 4880 | 14640 |
| ttg atc gat atg gac gac gag cga gca tcg cag acg gca ctc gcc gaa Leu Ile Asp Met Asp Asp Glu Arg Ala Ser Gln Thr Ala Leu Ala Glu 4885 4890 4895 | 14688 |
| gcg ctg act gcg gga gaa gcg cag ctc gcg gtg cgg tcg gga gtt gtg Ala Leu Thr Ala Gly Glu Ala Gln Leu Ala Val Arg Ser Gly Val Val 4900 4905 4910 | 14736 |
| ctg gcg ccc cgc ctc ggc cag gtg aag gtg agt gga ggt gaa gcg ttc Leu Ala Pro Arg Leu Gly Gln Val Lys Val Ser Gly Gly Glu Ala Phe 4915 4920 4925 | 14784 |
| agg tgg gat gaa ggc acc gtg ctg gtc acc ggc gga acc ggc ggg ctc Arg Trp Asp Glu Gly Thr Val Leu Val Thr Gly Gly Thr Gly Gly Leu 4930 4935 4940 | 14832 |
| ggg gcc ctg ctc gca cgc cat ctg gtc agc gcc cac ggt gtg cgg cac Gly Ala Leu Leu Ala Arg His Leu Val Ser Ala His Gly Val Arg His 4945 4950 4955 4960 | 14880 |
| ctg ttg ctc gca agt cgc cgt ggt ctg gcg gcg ccc gga gcg gat gag Leu Leu Leu Ala Ser Arg Arg Gly Leu Ala Ala Pro Gly Ala Asp Glu 4965 4970 4975 | 14928 |
| ctg gtg gcc gag ctg gag cag gcc ggc gcc gac gtc gcg gtc gtc gcg Leu Val Ala Glu Leu Glu Gln Ala Gly Ala Asp Val Ala Val Val Ala 4980 4985 4990 | 14976 |
| tgc gac tcg gca gat cgg gac tcg ctt gcg cgg ctg gtg gcg tcg gtg Cys Asp Ser Ala Asp Arg Asp Ser Leu Ala Arg Leu Val Ala Ser Val 4995 5000 5005 | 15024 |
| cct gcg gaa aac ccg ttg cgg gtg gtg gtg cac gcc gcc ggt gtg ctg Pro Ala Glu Asn Pro Leu Arg Val Val Val His Ala Ala Gly Val Leu 5010 5015 5020 | 15072 |
| gat gac ggt gtg ctg atg tcg atg tcg ccg gag cgc ttg gac gcg gtg Asp Asp Gly Val Leu Met Ser Met Ser Pro Glu Arg Leu Asp Ala Val 5025 5030 5035 5040 | 15120 |
| ttg cgg ccc aaa gtg gat gcc gcg tgg tac ctg cac gag ctg act cgg Leu Arg Pro Lys Val Asp Ala Ala Trp Tyr Leu His Glu Leu Thr Arg 5045 5050 5055 | 15168 |
| gaa ctc ggt ctg tcg gcg ttc gtg ttg ttc tcc tcg gtc gcg ggc ctg Glu Leu Gly Leu Ser Ala Phe Val Leu Phe Ser Ser Val Ala Gly Leu 5060 5065 5070 | 15216 |

| | |
|-----------------------------------------------------------------|-------|
| ttc ggc ggt gcg ggg cag agc aat tac gct gcc ggc aac gct ttc ctg | 15264 |
| Phe Gly Gly Ala Gly Gln Ser Asn Tyr Ala Ala Gly Asn Ala Phe Leu | |
| 5075 5080 5085 | |
| gat gcc ttg gcg cat tgc cgg cag gcc cag ggg ctg ccc gcg ctg tcg | 15312 |
| Asp Ala Leu Ala His Cys Arg Gln Ala Gln Gly Leu Pro Ala Leu Ser | |
| 5090 5095 5100 | |
| ctg gcc tcc ggg ctg tgg gcg agt atc gat gga atg gcg ggc gac ctc | 15360 |
| Leu Ala Ser Gly Leu Trp Ala Ser Ile Asp Gly Met Ala Gly Asp Leu | |
| 5105 5110 5115 5120 | |
| gct gcg gca gat gtg gag cgg ctg tcg cgg gca ggc att ggc ccg ctt | 15408 |
| Ala Ala Ala Asp Val Glu Arg Leu Ser Arg Ala Gly Ile Gly Pro Leu | |
| 5125 5130 5135 | |
| tcg gca ccg gga ggg ctg gcc ttg ttc gac gct gcc gtt ggc tcg gac | 15456 |
| Ser Ala Pro Gly Gly Leu Ala Leu Phe Asp Ala Ala Val Gly Ser Asp | |
| 5140 5145 5150 | |
| gaa ccg ttg ctg gca ccg gtg cga ctg gat gtc gaa gca ctg cgt gtg | 15504 |
| Glu Pro Leu Leu Ala Pro Val Arg Leu Asp Val Glu Ala Leu Arg Val | |
| 5155 5160 5165 | |
| cag gcc cga tcc gtg cag acc cgg att ccg gaa atg ctg cat ggc atg | 15552 |
| Gln Ala Arg Ser Val Gln Thr Arg Ile Pro Glu Met Leu His Gly Met | |
| 5170 5175 5180 | |
| gca atg ggg cca agc cgc cgc act ccg ttc act tcc agg gtt gag ccg | 15600 |
| Ala Met Gly Pro Ser Arg Arg Thr Pro Phe Thr Ser Arg Val Glu Pro | |
| 5185 5190 5195 5200 | |
| ttg cac gaa cgg ctg gcc gga ttg tcg gag ggc gaa cgt cgg cag caa | 15648 |
| Leu His Glu Arg Leu Ala Gly Leu Ser Glu Gly Glu Arg Arg Gln Gln | |
| 5205 5210 5215 | |
| gtg ctc cag cgc gtc cgc gcc gat atc gcg gtg gta ctg ggg cac ggc | 15696 |
| Val Leu Gln Arg Val Arg Ala Asp Ile Ala Val Val Leu Gly His Gly | |
| 5220 5225 5230 | |
| agg tcg agc gat gtg gac atc gag aag cct ttg gcc gag ctg ggt ttc | 15744 |
| Arg Ser Ser Asp Val Asp Ile Glu Lys Pro Leu Ala Glu Leu Gly Phe | |
| 5235 5240 5245 | |
| gac tcg ctg acg gcc atc gaa ctc cgc aac cgt ctc gct acc gcc acc | 15792 |
| Asp Ser Leu Thr Ala Ile Glu Leu Arg Asn Arg Leu Ala Thr Ala Thr | |
| 5250 5255 5260 | |
| gga ctg cgg ctt ccc gcg acg ctg gcc ttc gac cac ggc act gcg gcg | 15840 |
| Gly Leu Arg Leu Pro Ala Thr Leu Ala Phe Asp His Gly Thr Ala Ala | |
| 5265 5270 5275 5280 | |
| gca ctc gcc cag cac gtg tgc gcg cag cta ggc acc gcg acc gcg ccg | 15888 |
| Ala Leu Ala Gln His Val Cys Ala Gln Leu Gly Thr Ala Thr Ala Pro | |
| 5285 5290 5295 | |
| gca ccg agg cga acc gac gac aac gac gcc acg gag ccc gtg agg tcg | 15936 |

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|-----------------------------------------------------------------|-------|
| Ala Pro Arg Arg Thr Asp Asp Asn Asp Ala Thr Glu Pro Val Arg Ser | |
| 5300 5305 5310 | |
| ctc ttc caa cag gcg tat gcg gct ggc cgg ata ctt gac ggg atg gat | 15984 |
| Leu Phe Gln Gln Ala Tyr Ala Ala Gly Arg Ile Leu Asp Gly Met Asp | |
| 5315 5320 5325 | |
| ttg gtg aag gtc gct gcc cag ttg cga ccg gtg ttc ggt tcg cct ggc | 16032 |
| Leu Val Lys Val Ala Ala Gln Leu Arg Pro Val Phe Gly Ser Pro Gly | |
| 5330 5335 5340 | |
| gag ctg gaa tcc ctg ccg aaa ccc gtc cag ctt tcc cgt ggt ccc gaa | 16080 |
| Glu Leu Glu Ser Leu Pro Lys Pro Val Gln Leu Ser Arg Gly Pro Glu | |
| 5345 5350 5355 5360 | |
| gag ctt gcc ttg gtg tgc atg ccg gcg ctg atc ggg atg ccg ccc gca | 16128 |
| Glu Leu Ala Leu Val Cys Met Pro Ala Leu Ile Gly Met Pro Pro Ala | |
| 5365 5370 5375 | |
| cag cag tac gcg cgg atc gcc gcc ggg ttc cgc gat gtg cgg gac gtt | 16176 |
| Gln Gln Tyr Ala Arg Ile Ala Ala Gly Phe Arg Asp Val Arg Asp Val | |
| 5380 5385 5390 | |
| tcg gtg atc ccg atg cct gga ttc att gcg gga gaa ccg ctg ccg tcc | 16224 |
| Ser Val Ile Pro Met Pro Gly Phe Ile Ala Gly Glu Pro Leu Pro Ser | |
| 5395 5400 5405 | |
| gcc atc gag gtg gcg gtt cgg acg cag gcg gag gcg gtg ctg cag gaa | 16272 |
| Ala Ile Glu Val Ala Val Arg Thr Gln Ala Glu Ala Val Leu Gln Glu | |
| 5410 5415 5420 | |
| ttc gcc ggg ggc tcg ttc gta ctg gtc ggg cat tcc tcc ggg ggc tgg | 16320 |
| Phe Ala Gly Gly Ser Phe Val Leu Val Gly His Ser Ser Gly Gly Trp | |
| 5425 5430 5435 5440 | |
| ctg gcg cac gag gta gcc ggt gag ctg gag cgt cgc ggg gtc gtc ccg | 16368 |
| Leu Ala His Glu Val Ala Gly Glu Leu Glu Arg Arg Gly Val Val Pro | |
| 5445 5450 5455 | |
| gcc ggg gtc gta ctg ctg gac acc tac atc ccc ggt gag atc acg ccg | 16416 |
| Ala Gly Val Val Leu Leu Asp Thr Tyr Ile Pro Gly Glu Ile Thr Pro | |
| 5460 5465 5470 | |
| agg ttc tcc gtg gcg atg gcc cac cgg acg tat gag aag ctc gcg act | 16464 |
| Arg Phe Ser Val Ala Met Ala His Arg Thr Tyr Glu Lys Leu Ala Thr | |
| 5475 5480 5485 | |
| ttc acg gac atg cag gat gtc ggt atc acc gcg atg ggc ggg tac ttc | 16512 |
| Phe Thr Asp Met Gln Asp Val Gly Ile Thr Ala Met Gly Gly Tyr Phe | |
| 5490 5495 5500 | |
| cgg atg ttc acc gag tgg act ccg acg ccg atc ggt gct ccg acg ctg | 16560 |
| Arg Met Phe Thr Glu Trp Thr Pro Thr Pro Ile Gly Ala Pro Thr Leu | |
| 5505 5510 5515 5520 | |
| ttc gtg cgg acc gaa gat tgc gtc gca gac cct gaa ggg cgg ccg tgg | 16608 |
| Phe Val Arg Thr Glu Asp Cys Val Ala Asp Pro Glu Gly Arg Pro Trp | |

| 5525 | 5530 | 5535 | |
|-----------------------------------------------------------------|------|------|-------|
| aca gat gac tcc tgg cgg cca ggg tgg act ctc gcg gat gcc acg gtc | | | 16656 |
| Thr Asp Asp Ser Trp Arg Pro Gly Trp Thr Leu Ala Asp Ala Thr Val | | | |
| 5540 | 5545 | 5550 | |
| cag gtg ccg ggc gac cac ttc tcg atg atg gac gag cac gcc ggg tcc | | | 16704 |
| Gln Val Pro Gly Asp His Phe Ser Met Met Asp Glu His Ala Gly Ser | | | |
| 5555 | 5560 | 5565 | |
| acc gca cag gca gtc gcg agt tgg ctt gac aaa ctc aac cag cgc acc | | | 16752 |
| Thr Ala Gln Ala Val Ala Ser Trp Leu Asp Lys Leu Asn Gln Arg Thr | | | |
| 5570 | 5575 | 5580 | |
| gct cgg caa cgc tga | | | 16767 |
| Ala Arg Gln Arg | | | |
| 5585 | | | |
| <210> 50 | | | |
| <211> 5588 | | | |
| <212> PRT | | | |
| <213> Saccharopolyspora spinosa | | | |
| <400> 50 | | | |
| Met Ala Asn Glu Glu Lys Leu Arg Glu Tyr Leu Lys Arg Val Val Val | | | |
| 1 | 5 | 10 | 15 |
| Glu Leu Glu Glu Ala His Glu Arg Leu His Glu Leu Glu Arg Gln Glu | | | |
| 20 | 25 | 30 | |
| His Asp Pro Ile Ala Ile Val Ser Met Gly Cys Arg Tyr Pro Gly Gly | | | |
| 35 | 40 | 45 | |
| Val Ser Thr Pro Glu Glu Leu Trp Arg Leu Val Val Asp Gly Gly Asp | | | |
| 50 | 55 | 60 | |
| Ala Ile Ala Asn Phe Pro Glu Asp Arg Gly Trp Asn Leu Asp Glu Leu | | | |
| 65 | 70 | 75 | 80 |
| Phe Asp Pro Asp Pro Gly Arg Ala Gly Thr Ser Tyr Val Arg Glu Gly | | | |
| 85 | 90 | 95 | |
| Gly Phe Leu Arg Gly Val Ala Asp Phe Asp Ala Gly Leu Phe Gly Ile | | | |
| 100 | 105 | 110 | |
| Ser Pro Arg Glu Ala Gln Ala Met Asp Pro Gln Gln Arg Leu Leu Leu | | | |
| 115 | 120 | 125 | |
| Glu Ile Ser Trp Glu Val Phe Glu Arg Ala Gly Ile Asp Pro Phe Ser | | | |
| 130 | 135 | 140 | |
| Leu Arg Gly Thr Lys Thr Gly Val Phe Ala Gly Leu Ile Tyr His Asp | | | |
| 145 | 150 | 155 | 160 |
| Tyr Ala Ser Arg Phe Arg Lys Thr Pro Ala Glu Phe Glu Gly Tyr Phe | | | |
| 165 | 170 | 175 | |

| | | |
|-----------------------------------------------------------------|---------------------|-----------------|
| Ala Thr Gly Asn Ala Gly Ser Val | Ala Ser Gly Arg Val | Ala Tyr Thr |
| 180 | 185 | 190 |
| Phe Gly Leu Glu Gly Pro Ala Val | Thr Val Asp Thr | Ala Cys Ser Ser |
| 195 | 200 | 205 |
| Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser | Leu Arg Leu Gly Glu | |
| 210 | 215 | 220 |
| Cys Asp Leu Ala Leu Ala Gly Gly Ile Ser Val Met Ala Thr Pro Gly | | |
| 225 | 230 | 235 240 |
| Ala Phe Val Glu Phe Ser Arg Gln Arg Ala Leu Ala Ser Asp Gly Arg | | |
| | 245 | 250 255 |
| Cys Lys Pro Phe Ala Asp Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly | | |
| | 260 | 265 270 |
| Ala Gly Met Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly | | |
| | 275 | 280 285 |
| His Pro Val Leu Ala Ala Val Val Gly Ser Ala Ile Asn Gln Asp Gly | | |
| | 290 | 295 300 |
| Thr Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln Gln Arg Val | | |
| 305 | 310 | 315 320 |
| Ile Arg Gln Ala Leu Ala Asn Ala Gly Leu Ser Pro Ala Glu Val Asp | | |
| | 325 | 330 335 |
| Val Val Glu Ala His Gly Thr Gly Thr Ala Leu Gly Asp Pro Ile Glu | | |
| | 340 | 345 350 |
| Ala Gln Ala Leu Ile Ala Thr Tyr Gly Ala Asn Arg Ser Ala Asp His | | |
| | 355 | 360 365 |
| Pro Leu Leu Leu Gly Ser Leu Lys Ser Asn Ile Gly His Thr Gln Ala | | |
| | 370 | 375 380 |
| Ala Ala Gly Val Ala Gly Val Ile Lys Ser Val Leu Ala Ile Arg His | | |
| 385 | 390 | 395 400 |
| Arg Glu Met Pro Arg Ser Leu His Ile Asp Gln Pro Ser Gln His Val | | |
| | 405 | 410 415 |
| Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Asp Ser Val Asp Trp | | |
| | 420 | 425 430 |
| Pro Asp Leu Gly Arg Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Met | | |
| | 435 | 440 445 |
| Ser Gly Thr Asn Ala His Leu Ile Val Glu Glu Val Ser Asp Glu Pro | | |
| | 450 | 455 460 |
| Val Ser Gly Ser Thr Glu Pro Thr Gly Ala Phe Pro Trp Pro Leu Ser | | |
| 465 | 470 | 475 480 |

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Lys | Thr | Glu | Thr | Ala | Leu | Arg | Glu | Gln | Ala | Ala | Glu | Leu | Leu | Ser | 485 | 490 | 495 |
| Val | Val | Thr | Glu | His | Pro | Glu | Pro | Gly | Leu | Gly | Asp | Val | Gly | Tyr | Ser | 500 | 505 | 510 |
| Leu | Ala | Thr | Gly | Arg | Ala | Ala | Met | Glu | His | Arg | Ala | Val | Val | Val | Ala | 515 | 520 | 525 |
| Asp | Asp | Arg | Asp | Ser | Phe | Val | Ala | Gly | Leu | Thr | Ala | Leu | Ala | Ala | Gly | 530 | 535 | 540 |
| Val | Pro | Ala | Ala | Asn | Val | Val | Gln | Gly | Ala | Ala | Asp | Cys | Lys | Gly | Lys | 545 | 550 | 555 |
| Val | Ala | Phe | Val | Phe | Pro | Gly | Gln | Gly | Ser | His | Trp | Gln | Gly | Met | Ala | 565 | 570 | 575 |
| Arg | Glu | Leu | Ser | Glu | Ser | Ser | Pro | Val | Phe | Arg | Arg | Lys | Leu | Ala | Glu | 580 | 585 | 590 |
| Cys | Ala | Ala | Ala | Thr | Ala | Pro | Tyr | Val | Asp | Trp | Ser | Leu | Leu | Gly | Val | 595 | 600 | 605 |
| Leu | Arg | Gly | Asp | Pro | Asp | Ala | Pro | Ala | Leu | Asp | Arg | Asp | Asp | Val | Ile | 610 | 615 | 620 |
| Gln | Leu | Ala | Leu | Phe | Ala | Met | Met | Val | Ser | Leu | Ala | Glu | Leu | Trp | Arg | 625 | 630 | 635 |
| Ser | Cys | Gly | Val | Glu | Pro | Ala | Ala | Val | Val | Gly | His | Ser | Gln | Gly | Glu | 645 | 650 | 655 |
| Ile | Ala | Ala | Ala | His | Val | Ala | Gly | Ala | Leu | Ser | Leu | Thr | Asp | Ala | Val | 660 | 665 | 670 |
| Arg | Ile | Ile | Ala | Ala | Arg | Cys | Asp | Ala | Val | Ser | Ala | Leu | Thr | Gly | Lys | 675 | 680 | 685 |
| Gly | Gly | Met | Leu | Ala | Ile | Ala | Leu | Pro | Glu | Ser | Ala | Val | Val | Lys | Arg | 690 | 695 | 700 |
| Ile | Ala | Gly | Leu | Pro | Glu | Leu | Thr | Val | Ala | Ala | Val | Asn | Gly | Pro | Gly | 705 | 710 | 715 |
| Ser | Thr | Val | Val | Ser | Gly | Glu | Pro | Ser | Ala | Leu | Glu | Arg | Leu | Gln | Thr | 725 | 730 | 735 |
| Glu | Leu | Thr | Ala | Glu | Asn | Val | Gln | Thr | Arg | Arg | Val | Gly | Ile | Asp | Tyr | 740 | 745 | 750 |
| Ala | Ser | His | Ser | Pro | Gln | Ile | Ala | Gln | Val | Gln | Gly | Arg | Leu | Leu | Asp | 755 | 760 | 765 |
| Arg | Leu | Gly | Glu | Val | Gly | Ser | Glu | Pro | Ala | Glu | Ile | Ala | Phe | Tyr | Ser | 770 | 775 | 780 |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Thr | Val | Thr | Gly | Glu | Arg | Thr | Asp | Thr | Gly | Arg | Leu | Asp | Ala | Asp | Tyr | 785 | 790 | 795 | 800 |
| Trp | Tyr | Gln | Asn | Leu | Arg | Gln | Pro | Val | Arg | Phe | Gln | Gln | Thr | Val | Ala | 805 | 810 | | 815 |
| Arg | Met | Ala | Asp | Gln | Gly | Tyr | Arg | Phe | Phe | Val | Glu | Val | Ser | Pro | His | 820 | 825 | | 830 |
| Pro | Leu | Leu | Thr | Ala | Gly | Ile | Gln | Glu | Thr | Leu | Glu | Ala | Ala | Asp | Ala | 835 | 840 | | 845 |
| Gly | Gly | Val | Val | Val | Gly | Ser | Leu | Arg | Arg | Gly | Glu | Gly | Gly | Ser | Arg | 850 | 855 | | 860 |
| Arg | Trp | Leu | Thr | Ser | Leu | Ala | Glu | Cys | Gln | Val | Arg | Gly | Leu | Pro | Val | 865 | 870 | 875 | 880 |
| Asn | Trp | Glu | Gln | Val | Phe | Leu | Asn | Thr | Gly | Ala | Arg | Arg | Val | Pro | Leu | 885 | 890 | | 895 |
| Pro | Thr | Tyr | Pro | Phe | Gln | Arg | Gln | Arg | Tyr | Trp | Leu | Glu | Ser | Ala | Glu | 900 | 905 | | 910 |
| Tyr | Asp | Ala | Gly | Asp | Leu | Gly | Ser | Val | Gly | Leu | Leu | Ser | Ala | Glu | His | 915 | 920 | | 925 |
| Pro | Leu | Leu | Gly | Ala | Ala | Val | Thr | Leu | Ala | Asp | Ala | Gly | Gly | Phe | Leu | 930 | 935 | | 940 |
| Leu | Thr | Gly | Lys | Leu | Ser | Val | Lys | Thr | Gln | Pro | Trp | Leu | Ala | Asp | His | 945 | 950 | 955 | 960 |
| Val | Val | Gly | Gly | Ala | Ile | Leu | Leu | Pro | Gly | Thr | Ala | Phe | Val | Glu | Met | 965 | 970 | | 975 |
| Leu | Ile | Arg | Ala | Ala | Asp | Gln | Val | Gly | Cys | Asp | Leu | Ile | Glu | Glu | Leu | 980 | 985 | | 990 |
| Ser | Leu | Thr | Thr | Pro | Leu | Val | Leu | Pro | Ala | Thr | Gly | Ala | Val | Gln | Val | 995 | 1000 | | 1005 |
| Gln | Ile | Ala | Val | Gly | Gly | Pro | Asp | Glu | Ala | Gly | Arg | Arg | Ser | Val | Arg | 1010 | 1015 | | 1020 |
| Val | His | Ser | Cys | Arg | Asp | Asp | Ala | Val | Pro | Gln | Asp | Ser | Trp | Thr | Cys | 1025 | 1030 | 1035 | 1040 |
| His | Ala | Thr | Gly | Thr | Leu | Thr | Ser | Ser | Asp | His | Gln | Asp | Ala | Gly | Gln | 1045 | 1050 | | 1055 |
| Gly | Pro | Asp | Gly | Ile | Trp | Pro | Pro | Asn | Asp | Ala | Val | Ala | Val | Pro | Leu | 1060 | 1065 | | 1070 |
| Asp | Ser | Phe | Tyr | Ala | Arg | Ala | Ala | Glu | Arg | Gly | Phe | Asp | Phe | Gly | Pro | 1075 | 1080 | | 1085 |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Ala Phe Gln Gly Leu Gln Ala Ala Trp Lys Arg Gly Asp Glu Ile Phe | | | |
| 1090 | 1095 | 1100 | |
| Ala Glu Val Gly Leu Pro Thr Ala His Arg Glu Asp Ala Gly Arg Phe | | | |
| 1105 | 1110 | 1115 | 1120 |
| Gly Ile His Pro Ala Leu Leu Asp Ala Ala Leu Gln Ala Leu Gly Ala | | | |
| | 1125 | 1130 | 1135 |
| Ala Glu Glu Asp Pro Asp Glu Gly Trp Leu Pro Phe Ala Trp Gln Gly | | | |
| | 1140 | 1145 | 1150 |
| Val Ser Leu Lys Ala Thr Gly Ala Leu Ser Leu Arg Val His Leu Val | | | |
| | 1155 | 1160 | 1165 |
| Pro Ala Gly Ala Asn Ala Val Ser Val Phe Thr Thr Asp Thr Thr Gly | | | |
| | 1170 | 1175 | 1180 |
| Gln Ala Val Leu Ser Ile Asp Ser Leu Val Leu Arg Gln Ile Ser Asp | | | |
| 1185 | 1190 | 1195 | 1200 |
| Lys Gln Leu Ala Ala Ala Arg Ala Met Glu His Glu Ser Leu Phe Arg | | | |
| | 1205 | 1210 | 1215 |
| Val Asp Trp Lys Arg Ile Ser Pro Gly Ala Ala Lys Pro Val Ser Trp | | | |
| | 1220 | 1225 | 1230 |
| Ala Val Ile Gly Asn Asp Glu Leu Ala Arg Ala Cys Gly Ser Ala Leu | | | |
| | 1235 | 1240 | 1245 |
| Gly Thr Glu Leu His Pro Asp Leu Thr Gly Leu Ala Asp Pro Pro Pro | | | |
| | 1250 | 1255 | 1260 |
| Asp Val Val Val Val Pro Cys Gly Ala Ser Arg Gln Asp Leu Asp Val | | | |
| 1265 | 1270 | 1275 | 1280 |
| Ala Ser Glu Ala Arg Ala Ala Thr Gln Arg Met Leu Asp Leu Ile Gln | | | |
| | 1285 | 1290 | 1295 |
| Asp Trp Leu Ala Ala Ala Arg Phe Ala Gly Ser Arg Leu Val Val Val | | | |
| | 1300 | 1305 | 1310 |
| Thr Cys Gly Ala Ala Ser Thr Gly Pro Ala Glu Gly Val Ser Asp Leu | | | |
| | 1315 | 1320 | 1325 |
| Val His Ala Ala Ser Trp Gly Leu Leu Arg Ser Ala Gln Ser Glu Asn | | | |
| | 1330 | 1335 | 1340 |
| Pro Asp Arg Phe Val Leu Val Asp Val Asp Gly Thr Ala Glu Ser Trp | | | |
| 1345 | 1350 | 1355 | 1360 |
| Arg Ala Leu Ala Ala Ala Val Arg Ser Gly Glu Pro Gln Leu Ala Leu | | | |
| | 1365 | 1370 | 1375 |
| Arg Ala Gly Glu Val Arg Val Pro Arg Leu Ala Arg Cys Val Ala Ala | | | |
| | 1380 | 1385 | 1390 |

| | | |
|-----------------------------------------------------------------|------|-----------|
| Glu Asp Ser Arg Ile Pro Val Pro Gly Ala Asp Gly Thr Val Leu Ile | | |
| 1395 | 1400 | 1405 |
| Ser Gly Gly Thr Gly Leu Leu Gly Gly Leu Val Ala Arg His Leu Val | | |
| 1410 | 1415 | 1420 |
| Ala Glu Arg Gly Val Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp | | |
| 1425 | 1430 | 1435 1440 |
| Ser Ala Pro Gly Val Thr Asp Leu Val Asp Glu Leu Val Gly Leu Gly | | |
| 1445 | 1450 | 1455 |
| Ala Ala Val Glu Val Ala Ser Cys Asp Val Gly Asp Arg Ala Gln Leu | | |
| 1460 | 1465 | 1470 |
| Asp Arg Leu Leu Thr Thr Ile Ser Ala Glu Phe Pro Leu Arg Gly Val | | |
| 1475 | 1480 | 1485 |
| Val His Ala Ala Gly Ala Leu Ala Asp Gly Val Val Glu Ser Leu Thr | | |
| 1490 | 1495 | 1500 |
| Pro Glu His Val Ala Lys Val Phe Gly Pro Lys Ala Ala Gly Ala Trp | | |
| 1505 | 1510 | 1515 1520 |
| His Leu His Glu Leu Thr Leu Asp Leu Asp Leu Ser Phe Phe Val Leu | | |
| 1525 | 1530 | 1535 |
| Phe Ser Ser Phe Ser Gly Val Ala Gly Ala Ala Gly Gln Gly Asn Tyr | | |
| 1540 | 1545 | 1550 |
| Ala Ala Ala Asn Ala Phe Leu Asp Gly Leu Ala Gln His Arg Arg Thr | | |
| 1555 | 1560 | 1565 |
| Ala Gly Leu Pro Ala Val Ser Leu Ala Trp Gly Leu Trp Glu Gln Pro | | |
| 1570 | 1575 | 1580 |
| Ser Gly Met Thr Gly Ala Leu Asp Ala Ala Gly Arg Ser Arg Ile Ala | | |
| 1585 | 1590 | 1595 1600 |
| Arg Thr Asn Pro Pro Met Ser Ala Pro Asp Gly Leu Arg Leu Phe Glu | | |
| 1605 | 1610 | 1615 |
| Met Ala Phe Arg Val Pro Gly Glu Ser Leu Leu Val Pro Val His Val | | |
| 1620 | 1625 | 1630 |
| Asp Leu Asn Ala Leu Arg Ala Asp Ala Ala Asp Gly Gly Val Pro Ala | | |
| 1635 | 1640 | 1645 |
| Leu Leu Arg Asp Leu Val Pro Ala Pro Val Arg Arg Ser Ala Val Asn | | |
| 1650 | 1655 | 1660 |
| Glu Ser Ala Asp Val Asn Gly Leu Val Gly Arg Leu Arg Arg Leu Pro | | |
| 1665 | 1670 | 1675 1680 |
| Asp Leu Asp Gln Glu Thr Gln Leu Leu Gly Leu Val Arg Glu His Val | | |
| 1685 | 1690 | 1695 |

Ser Ala Val Leu Gly His Ser Gly Ala Val Glu Val Gly Ala Asp Arg
 1700 1705 1710

Ala Phe Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Phe Arg
 1715 1720 1725

Asn Arg Leu Gly Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val
 1730 1735 1740

Phe Asp Tyr Pro Thr Pro Arg Ala Leu Val Arg Phe Leu Leu Asp Lys
 1745 1750 1755 1760

Leu Ile Gly Gly Val Glu Ala Pro Thr Pro Ala Pro Ala Ala Val Ala
 1765 1770 1775

Ala Val Thr Ala Asp Asp Pro Val Val Ile Val Gly Met Gly Cys Arg
 1780 1785 1790

Tyr Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala
 1795 1800 1805

Gly Gly Leu Asp Ala Val Ala Glu Phe Pro Asp Asp Arg Gly Trp Asp
 1810 1815 1820

Gln Ala Gly Leu Phe Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr
 1825 1830 1835 1840

Val Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Gly
 1845 1850 1855

Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln
 1860 1865 1870

Arg Leu Leu Leu Glu Val Ala Trp Glu Thr Val Glu Arg Ala Gly Ile
 1875 1880 1885

Asp Pro Leu Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu
 1890 1895 1900

Met His His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly
 1905 1910 1915 1920

Phe Glu Gly Tyr Leu Gly Asn Gly Ser Ala Gly Gly Val Phe Ser Gly
 1925 1930 1935

Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp
 1940 1945 1950

Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala
 1955 1960 1965

Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val
 1970 1975 1980

Met Ala Thr Pro Gly Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu
 1985 1990 1995 2000

| | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|--|--|--|
| Ala | Ala | Asp | Gly | Arg | Cys | Lys | Ser | Phe | Ala | Ala | Ala | Ala | Asp | Gly | Thr | | | |
| | | | 2005 | | | | | | 2010 | | | | | 2015 | | | | |
| Gly | Trp | Gly | Glu | Gly | Ala | Gly | Leu | Val | Leu | Leu | Glu | Arg | Leu | Ser | Asp | | | |
| | | 2020 | | | | | 2025 | | | | | | 2030 | | | | | |
| Ala | Arg | Arg | Asn | Gly | His | Ala | Val | Leu | Ala | Val | Val | Arg | Gly | Ser | Ala | | | |
| | | 2035 | | | | | 2040 | | | | | 2045 | | | | | | |
| Val | Asn | Gln | Asp | Gly | Ala | Ser | Asn | Gly | Leu | Thr | Ala | Pro | Asn | Gly | Pro | | | |
| | | 2050 | | | | 2055 | | | | | 2060 | | | | | | | |
| Ser | Gln | Gln | Arg | Val | Ile | Thr | Gln | Ala | Leu | Ala | Ser | Ala | Gly | Leu | Ser | | | |
| 2065 | | | | 2070 | | | | | 2075 | | | | | 2080 | | | | |
| Val | Ser | Asp | Val | Asp | Ala | Val | Glu | Ala | His | Gly | Thr | Gly | Thr | Arg | Leu | | | |
| | | | 2085 | | | | | 2090 | | | | | | 2095 | | | | |
| Gly | Asp | Pro | Ile | Glu | Ala | Gln | Ala | Leu | Ile | Ala | Thr | Tyr | Gly | Gln | Gly | | | |
| | | 2100 | | | | | 2105 | | | | | | 2110 | | | | | |
| Arg | Asp | Ser | Asp | Arg | Pro | Leu | Trp | Leu | Gly | Ser | Val | Lys | Ser | Asn | Ile | | | |
| | | 2115 | | | | 2120 | | | | | | 2125 | | | | | | |
| Gly | His | Thr | Gln | Ala | Ala | Ala | Gly | Val | Ala | Gly | Val | Ile | Lys | Met | Val | | | |
| | 2130 | | | | 2135 | | | | | 2140 | | | | | | | | |
| Met | Ala | Met | Arg | His | Gly | Gln | Leu | Pro | Ala | Thr | Leu | His | Val | Asp | Glu | | | |
| 2145 | | | | 2150 | | | | | 2155 | | | | | 2160 | | | | |
| Pro | Thr | Ser | Glu | Val | Asp | Trp | Ser | Ala | Gly | Asp | Val | Gln | Leu | Leu | Thr | | | |
| | | | 2165 | | | | | 2170 | | | | | 2175 | | | | | |
| Glu | Asn | Thr | Pro | Trp | Pro | Gly | Asn | Ser | His | Pro | Arg | Arg | Val | Gly | Val | | | |
| | | 2180 | | | | | 2185 | | | | | | 2190 | | | | | |
| Ser | Ser | Phe | Gly | Ile | Ser | Gly | Thr | Asn | Ala | His | Val | Ile | Leu | Glu | Gln | | | |
| | | 2195 | | | | 2200 | | | | | | 2205 | | | | | | |
| Ala | Ser | Lys | Thr | Pro | Asp | Glu | Thr | Ala | Asp | Lys | Ser | Gly | Pro | Asp | Ser | | | |
| | | 2210 | | | | 2215 | | | | | | 2220 | | | | | | |
| Glu | Ser | Thr | Val | Asp | Leu | Pro | Ala | Val | Pro | Leu | Ile | Val | Ser | Gly | Arg | | | |
| 2225 | | | | 2230 | | | | | 2235 | | | | | 2240 | | | | |
| Thr | Pro | Ala | Ala | Leu | Ser | Ala | Gln | Ala | Ser | Ala | Leu | Leu | Ser | Tyr | Leu | | | |
| | | | 2245 | | | | | 2250 | | | | | | 2255 | | | | |
| Gly | Glu | Arg | Gly | Asp | Ile | Ser | Thr | Leu | Asp | Ala | Ala | Phe | Ser | Leu | Ala | | | |
| | | 2260 | | | | | | 2265 | | | | | 2270 | | | | | |
| Ser | Ser | Arg | Ala | Ala | Leu | Glu | Glu | Arg | Ala | Val | Val | Leu | Gly | Ala | Asp | | | |
| | | 2275 | | | | 2280 | | | | | | 2285 | | | | | | |
| Arg | Glu | Thr | Leu | Leu | Ser | Gly | Leu | Glu | Ala | Leu | Ala | Ser | Gly | Arg | Glu | | | |
| | 2290 | | | | | 2295 | | | | | 2300 | | | | | | | |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Ala Ser Gly Val Val Ser Gly Ser Pro Val Ser Gly Gly Val Gly Phe | | | |
| 2305 | 2310 | 2315 | 2320 |
| Val Phe Ala Gly Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu | | | |
| 2325 | 2330 | | 2335 |
| Tyr Ser Val Phe Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala | | | |
| 2340 | 2345 | | 2350 |
| Gly Leu Asp Ala His Leu Gly Gln Asp Val Gly Val Arg Asp Val Val | | | |
| 2355 | 2360 | | 2365 |
| Phe Gly Ser Asp Gly Ser Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser | | | |
| 2370 | 2375 | | 2380 |
| Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Ser Leu Leu Gly Ser Trp | | | |
| 2385 | 2390 | 2395 | 2400 |
| Gly Val Arg Pro Gly Val Val Leu Gly His Ser Val Gly Glu Phe Ala | | | |
| 2405 | 2410 | | 2415 |
| Ala Ala Val Ala Ala Gly Val Leu Ser Leu Pro Asp Ala Ala Arg Met | | | |
| 2420 | 2425 | | 2430 |
| Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala | | | |
| 2435 | 2440 | | 2445 |
| Met Leu Ala Val Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala | | | |
| 2450 | 2455 | | 2460 |
| Asp Arg Val Asp Gly Ala Gly Ile Ala Ala Val Asn Ala Pro Glu Ser | | | |
| 2465 | 2470 | 2475 | 2480 |
| Val Val Leu Ser Gly Asp Arg Glu Val Leu Asp Asp Ile Ala Gly Ala | | | |
| 2485 | 2490 | | 2495 |
| Leu Asp Gly Gln Gly Ile Arg Trp Arg Arg Leu Arg Val Ser His Ala | | | |
| 2500 | 2505 | | 2510 |
| Phe His Ser Tyr Arg Met Asp Pro Met Leu Gln Glu Phe Ala Glu Ile | | | |
| 2515 | 2520 | | 2525 |
| Ala Arg Ser Val Asp Tyr Arg Arg Gly Asp Leu Pro Val Val Ser Thr | | | |
| 2530 | 2535 | | 2540 |
| Leu Thr Gly Glu Leu Asp Thr Ala Gly Val Met Ala Thr Pro Glu Tyr | | | |
| 2545 | 2550 | 2555 | 2560 |
| Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Arg | | | |
| 2565 | 2570 | | 2575 |
| Val Leu Ala Gln Gln Gly Val Ala Thr Ile Phe Glu Leu Gly Pro Asp | | | |
| 2580 | 2585 | | 2590 |
| Ala Thr Leu Ser Ala Leu Ile Pro Asp Cys His Ser Trp Ala Asp Gln | | | |
| 2595 | 2600 | | 2605 |

| | | | |
|-----------------------------------------------------------------|------|------|------|
| Ala Met Pro Ile Pro Met Leu Arg Lys Asp Arg Thr Glu Thr Glu Thr | | | |
| 2610 | 2615 | 2620 | |
| Val Val Ala Ala Val Ala Arg Ala His Thr Arg Gly Val Pro Val Glu | | | |
| 2625 | 2630 | 2635 | 2640 |
| Trp Ser Ala Tyr Phe Ala Gly Thr Gly Ala Arg Arg Val Glu Leu Pro | | | |
| 2645 | 2650 | 2655 | |
| Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Glu Thr Ser Asp Tyr | | | |
| 2660 | 2665 | 2670 | |
| Gly Asp Val Thr Gly Ile Gly Leu Ala Ala Ala Glu His Pro Leu Leu | | | |
| 2675 | 2680 | 2685 | |
| Gly Ala Val Val Ala Leu Ala Asp Gly Asp Gly Met Val Leu Thr Gly | | | |
| 2690 | 2695 | 2700 | |
| Arg Leu Ser Val Gly Thr His Pro Trp Leu Ala Gln His Arg Val Leu | | | |
| 2705 | 2710 | 2715 | 2720 |
| Gly Glu Val Val Val Pro Gly Thr Ala Ile Leu Glu Met Ala Leu His | | | |
| 2725 | 2730 | 2735 | |
| Ala Gly Ala Arg Leu Gly Cys Asp Arg Val Glu Glu Leu Thr Leu Glu | | | |
| 2740 | 2745 | 2750 | |
| Thr Pro Leu Val Val Pro Glu Arg Ala Ala Gly Ala Gly Ser Arg Gly | | | |
| 2755 | 2760 | 2765 | |
| Pro Ala Gly Gly Thr Thr Val Ser Ile Glu Thr Ala Glu Glu Arg Val | | | |
| 2770 | 2775 | 2780 | |
| Arg Thr Asn Asp Ala Ile Glu Ile Gln Leu Leu Val Asn Ala Pro Asp | | | |
| 2785 | 2790 | 2795 | 2800 |
| Glu Gly Gly Arg Arg Arg Val Ser Leu Tyr Ser Arg Pro Ala Gly Gly | | | |
| 2805 | 2810 | 2815 | |
| Ser Arg Gly Gly Gly Trp Thr Arg His Ala Thr Gly Glu Leu Val Val | | | |
| 2820 | 2825 | 2830 | |
| Gly Thr Thr Gly Gly Arg Ala Val Pro Asp Trp Ser Ala Glu Gly Ala | | | |
| 2835 | 2840 | 2845 | |
| Glu Ser Ile Ala Leu Asp Glu Phe Tyr Val Ala Leu Ala Gly Asn Gly | | | |
| 2850 | 2855 | 2860 | |
| Phe Glu Tyr Gly Pro Leu Phe Gln Gly Leu Gln Ala Ala Trp Arg Arg | | | |
| 2865 | 2870 | 2875 | 2880 |
| Gly Asp Glu Val Leu Ala Glu Ile Ala Pro Pro Ala Glu Ala Asp Ala | | | |
| 2885 | 2890 | 2895 | |
| Met Ala Ser Gly Tyr Leu Leu Asp Pro Ala Leu Leu Asp Ala Ala Leu | | | |
| 2900 | 2905 | 2910 | |

Gln Ala Ser Ala Leu Gly Asp Arg Pro Glu Gln Gly Gly Ala Trp Leu
 2915 2920 2925

Pro Phe Ser Phe Thr Gly Val Glu Leu Ser Ala Pro Ala Gly Thr Ile
 2930 2935 2940

Ser Arg Val Arg Leu Glu Thr Arg Arg Pro Asp Ala Ile Ser Val Ala
 2945 2950 2955 2960

Val Met Asp Glu Ser Gly Arg Leu Leu Ala Ser Ile Asp Ser Leu Arg
 2965 2970 2975

Leu Arg Ser Val Ser Ser Gly Gln Leu Ala Asn Arg Asp Ala Val Arg
 2980 2985 2990

Asp Ala Leu Phe Glu Val Thr Trp Glu Pro Val Ala Thr Gln Ser Thr
 2995 3000 3005

Glu Pro Gly Arg Trp Ala Leu Leu Gly Asp Thr Ala Cys Gly Lys Asp
 3010 3015 3020

Asp Leu Ile Lys Leu Ala Thr Asp Ser Ala Asp Arg Cys Ala Asp Leu
 3025 3030 3035 3040

Ala Ala Leu Ala Glu Lys Leu Asp Ser Ser Ala Leu Val Pro Asp Val
 3045 3050 3055

Val Val Tyr Cys Ala Gly Glu Gln Ala Asp Pro Gly Thr Gly Ala Ala
 3060 3065 3070

Ala Leu Ala Glu Thr Gln Gln Thr Leu Ala Leu Leu Gln Ala Trp Leu
 3075 3080 3085

Ala Glu Pro Arg Leu Ala Glu Ala Arg Leu Val Val Val Thr Cys Ala
 3090 3095 3100

Ala Val Thr Thr Ala Pro Ser Asp Gly Ala Ser Glu Leu Ala His Ala
 3105 3110 3115 3120

Pro Leu Trp Gly Leu Leu Arg Ala Ala Gln Val Glu Asn Pro Gly Gln
 3125 3130 3135

Phe Val Leu Ala Asp Val Asp Gly Thr Ala Glu Ser Trp Arg Ala Leu
 3140 3145 3150

Pro Ser Ala Leu Gly Ser Met Glu Pro Gln Leu Ala Leu Arg Lys Gly
 3155 3160 3165

Ala Val Arg Ala Pro Arg Leu Ala Ser Val Ala Gly Gln Ile Asp Val
 3170 3175 3180

Pro Ala Val Val Ala Asp Pro Asp Arg Thr Val Leu Ile Ser Gly Gly
 3185 3190 3195 3200

Thr Gly Leu Leu Gly Gly Ala Val Ala Arg His Leu Val Thr Glu Arg
 3205 3210 3215

Gly Val Arg Arg Leu Val Leu Thr Gly Arg Arg Gly Trp Asp Ala Pro
 3220 3225 3230

Gly Ile Thr Glu Leu Val Gly Glu Leu Asn Gly Leu Gly Ala Val Val
 3235 3240 3245

Asp Val Val Ala Cys Asp Val Ala Asp Arg Ala Asp Leu Glu Ser Leu
 3250 3255 3260

Leu Ala Ala Val Pro Ala Glu Phe Pro Leu Cys Gly Val Val His Ala
 3265 3270 3275 3280

Ala Gly Ala Leu Ala Asp Gly Val Ile Glu Ser Leu Ser Pro Asp Asp
 3285 3290 3295

Val Gly Ala Val Phe Gly Pro Lys Ala Ala Gly Ala Trp Asn Leu His
 3300 3305 3310

Glu Leu Thr Arg Asp Thr Asp Leu Ser Phe Phe Ala Leu Phe Ser Ser
 3315 3320 3325

Leu Ser Gly Val Ala Gly Ala Pro Gly Gln Gly Asn Tyr Ala Ala Ala
 3330 3335 3340

Asn Ala Phe Leu Asp Ala Leu Ala His Tyr Arg Arg Ser Gln Gly Leu
 3345 3350 3355 3360

Pro Ala Val Ser Leu Ala Trp Gly Leu Trp Glu Gln Pro Ser Gly Met
 3365 3370 3375

Thr Glu Thr Leu Ser Glu Val Asp Arg Ser Arg Ile Ala Arg Ala Asn
 3380 3385 3390

Pro Pro Leu Ser Thr Lys Glu Gly Leu Arg Leu Phe Asp Ala Gly Leu
 3395 3400 3405

Ala Leu Asp Arg Ala Ala Val Val Pro Ala Lys Leu Asp Arg Thr Phe
 3410 3415 3420

Leu Ala Glu Gln Ala Arg Ser Gly Ser Leu Pro Ala Leu Leu Thr Ala
 3425 3430 3435 3440

Leu Val Pro Pro Ile Arg Arg Asn Arg Arg Ala Ser Gly Thr Glu Leu
 3445 3450 3455

Ala Asp Glu Gly Thr Leu Leu Gly Val Val Arg Glu His Ala Ala Ala
 3460 3465 3470

Val Leu Gly Tyr Ser Ser Ala Ala Asp Val Gly Val Glu Arg Ala Phe
 3475 3480 3485

Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Leu Arg Asn Arg
 3490 3495 3500

Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val Phe Asp
 3505 3510 3515 3520

Tyr Pro Thr Pro Arg Ala Leu Ala Arg Phe Leu His Gln Glu Leu Ala
 3525 3530 3535
 Asp Glu Ile Ala Thr Thr Pro Ala Pro Val Thr Thr Thr Arg Ala Pro
 3540 3545 3550
 Val Ala Glu Asp Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe
 3555 3560 3565
 Pro Gly Gln Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly
 3570 3575 3580
 Gly Val Asp Ala Val Ala Asp Phe Pro Ala Asp Arg Gly Trp Asp Leu
 3585 3590 3595 3600
 Ala Gly Leu Phe Asp Pro Asp Pro Glu Arg Ala Gly Lys Thr Tyr Val
 3605 3610 3615
 Arg Glu Gly Ala Phe Leu Thr Asp Ala Asp Arg Phe Asp Ala Gly Phe
 3620 3625 3630
 Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg
 3635 3640 3645
 Leu Leu Leu Glu Leu Ser Trp Glu Ala Ile Glu Arg Ala Gly Ile Asp
 3650 3655 3660
 Pro Gly Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met
 3665 3670 3675 3680
 Tyr His Asp Tyr Gly Ala Arg Phe Ala Ser Arg Ala Pro Glu Gly Phe
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 Glu Gly Tyr Leu Gly Asn Gly Ser Ala Gly Ser Val Ala Ser Gly Arg
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 Ile Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr
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 Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ser Leu
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 Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met
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 Ser Thr Pro Gly Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala
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 Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala Asp Gly Thr Gly
 3780 3785 3790
 Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala
 3795 3800 3805
 Arg Arg Asn Gly His Arg Val Leu Ala Val Val Arg Gly Ser Ala Val
 3810 3815 3820

| | | | |
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| Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser | | | |
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| Gln Gln Arg Val Ile Gln Gln Ala Leu Ala Ser Ala Gly Leu Ser Val | | | |
| | 3845 | 3850 | 3855 |
| Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly | | | |
| | 3860 | 3865 | 3870 |
| Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg | | | |
| | 3875 | 3880 | 3885 |
| Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly | | | |
| | 3890 | 3895 | 3900 |
| His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met | | | |
| 3905 | 3910 | 3915 | 3920 |
| Ala Met Arg His Gly Gln Leu Pro Arg Thr Leu His Val Asp Ala Pro | | | |
| | 3925 | 3930 | 3935 |
| Ser Ser Gln Val Asp Trp Ser Ala Gly Arg Val Gln Leu Leu Thr Glu | | | |
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| Asn Thr Pro Trp Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser | | | |
| | 3955 | 3960 | 3965 |
| Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser | | | |
| | 3970 | 3975 | 3980 |
| Thr Gly Gln Met Asp Gln Ala Ala Glu Pro Asp Ser Ser Pro Val Leu | | | |
| 3985 | 3990 | 3995 | 4000 |
| Asp Val Pro Val Val Pro Trp Val Val Ser Gly Lys Thr Pro Glu Ala | | | |
| | 4005 | 4010 | 4015 |
| Leu Ser Ala Gln Ala Ala Thr Leu Ala Thr Tyr Leu Asp Gln Asn Val | | | |
| | 4020 | 4025 | 4030 |
| Asp Val Ser Pro Leu Asp Val Gly Ile Ser Leu Ala Val Thr Arg Ser | | | |
| | 4035 | 4040 | 4045 |
| Ala Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Asp Thr Leu | | | |
| | 4050 | 4055 | 4060 |
| Leu Ser Gly Leu Asn Ala Leu Ala Ala Gly His Glu Ala Ala Gly Val | | | |
| 4065 | 4070 | 4075 | 4080 |
| Val Thr Gly Pro Val Gly Ile Gly Gly Arg Thr Gly Phe Val Phe Ala | | | |
| | 4085 | 4090 | 4095 |
| Gly Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Arg Leu Tyr Ser Glu | | | |
| | 4100 | 4105 | 4110 |
| Phe Pro Ala Phe Ala Gly Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp | | | |
| | 4115 | 4120 | 4125 |

Ala Asn Leu Gly Arg Glu Val Gly Val Arg Asp Val Val Phe Gly Ser
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Asp Glu Ser Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser Gly Leu Phe
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Ala Leu Gln Val Gly Leu Trp Glu Leu Leu Gly Thr Trp Gly Val Arg
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Pro Ser Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe
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Ala Ala Gly Val Leu Ser Met Ala Glu Ala Ala Arg Leu Val Ala Gly
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Val Ser Ala Thr Glu Ala Arg Val Gly Pro Leu Leu Asp Gly Val Arg
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Asp Arg Val Gly Val Ala Ala Val Asn Ala Pro Gly Ser Val Val Leu
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Ser Gly Asp Arg Asp Val Leu Asp Gly Ile Ala Gly Arg Leu Asp Gly
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Gln Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser
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His Arg Met Asp Pro Met Leu Ala Glu Phe Ala Glu Leu Ala Arg Ser
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Asn Leu Asp Asp Val Gly Val Met Ala Thr Pro Glu Tyr Trp Val Arg
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Gln Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Gln Ala Leu Val
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Asp Gln Gly Val Asp Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu
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Ser Ser Leu Val Gln Glu Cys Val Ala Glu Ser Gly Arg Ala Thr Gly
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Ile Pro Leu Val Arg Arg Asp Arg Asp Glu Val Arg Thr Val Leu Asp
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Phe Phe Ala Gly Thr Arg Ala Thr Gln Val Asp Leu Pro Thr Tyr Ala
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Phe Gln Arg Gln Arg Tyr Trp Leu Glu Pro Ser Asp Ser Gly Asp Val
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Asp Glu Asp Gly Asp Trp Arg Arg Ile Ala Ser Gly Leu Leu Ala Gln
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Ala Gly Gln Val Asp Leu Ala Glu Phe Tyr Glu Arg Leu Ala Glu Arg
4595 4600 4605
Gly Leu Thr Tyr Gly Pro Val Phe Gln Gly Leu Arg Ala Ala Trp Arg
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4625 4630 4635 4640
Gly Phe Gly Ile His Pro Ala Leu Leu Asp Ala Ala Leu His Ala Met
4645 4650 4655
Ala Leu Gly Ala Ser Pro Asp Ser Glu Ala Arg Leu Pro Phe Ser Trp
4660 4665 4670
Arg Gly Ala Gln Leu Tyr Arg Ala Glu Gly Ala Ala Leu Arg Val Arg
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Leu Ser Pro Leu Gly Ser Gly Ala Val Ser Leu Thr Leu Val Asp Ala
4690 4695 4700
Thr Gly Arg Arg Val Ala Ala Val Glu Ser Leu Ser Thr Arg Pro Val
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Ser Thr Asp Gln Ile Gly Ala Gly Arg Gly Asp Gln Glu Arg Leu Leu
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His Val Glu Trp Val Arg Ser Ala Glu Ser Ala Gly Met Ser Leu Thr
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 Ser Cys Ala Val Val Gly Leu Gly Glu Pro Glu Trp His Ala Ala Leu
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 Ala Thr Glu Val Ala Lys Arg Gly Ser Ala Pro Gly Ala Val Ile Val
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 Pro Cys Pro Arg Pro Arg Ala Met Gln Glu Leu Pro Thr Ala Ala Arg
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 Arg Ala Thr Gln Gln Ala Met Ala Met Leu Gln Gln Trp Leu Ala Asp
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 Asp Arg Phe Val Ser Thr Arg Leu Ile Leu Leu Thr His Arg Ala Val
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 Ser Ala Val Ala Gly Glu Asp Val Leu Asp Leu Val His Ala Pro Leu
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 Trp Gly Leu Val Arg Ser Ala Gln Ala Glu His Pro Asp Arg Phe Ala
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 Leu His Glu Arg Leu Ala Gly Leu Ser Glu Gly Glu Arg Arg Gln Gln
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 Val Leu Gln Arg Val Arg Ala Asp Ile Ala Val Val Leu Gly His Gly
 5220 5225 5230
 Arg Ser Ser Asp Val Asp Ile Glu Lys Pro Leu Ala Glu Leu Gly Phe
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 Asp Ser Leu Thr Ala Ile Glu Leu Arg Asn Arg Leu Ala Thr Ala Thr
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 Leu Val Lys Val Ala Ala Gln Leu Arg Pro Val Phe Gly Ser Pro Gly
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Glu Leu Ala Leu Val Cys Met Pro Ala Leu Ile Gly Met Pro Pro Ala
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Gln Gln Tyr Ala Arg Ile Ala Ala Gly Phe Arg Asp Val Arg Asp Val
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Ser Val Ile Pro Met Pro Gly Phe Ile Ala Gly Glu Pro Leu Pro Ser
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Phe Ala Gly Gly Ser Phe Val Leu Val Gly His Ser Ser Gly Gly Trp
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Ala Gly Val Val Leu Leu Asp Thr Tyr Ile Pro Gly Glu Ile Thr Pro
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Phe Thr Asp Met Gln Asp Val Gly Ile Thr Ala Met Gly Gly Tyr Phe
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Gln Val Pro Gly Asp His Phe Ser Met Met Asp Glu His Ala Gly Ser
5555 5560 5565

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<211> 2363

<212> DNA

<213> Saccharopolyspora spinosa

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<211> 990

<212> DNA

<213> *Saccharopolyspora spinosa*

<220>

<221> CDS

<222> (1)..(987)

<223> ORF23; dNDP-glucose-4,6-dehydratase

<400> 52

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| Val Val Val Leu Asp Lys Leu Thr Tyr Ala Gly Asn Glu Ala Asn Leu | |
| 35 40 45 | |
| gcg ccg gtc gcg gac aac ccc cgg ctg aag ttc gtc tgc ggc gac atc | 192 |
| Ala Pro Val Ala Asp Asn Pro Arg Leu Lys Phe Val Cys Gly Asp Ile | |
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| Cys Asp Arg Glu Leu Val Gly Gly Leu Met Ser Gly Val Asp Val Val | |
| 65 70 75 80 | |
| gtg cac ttc gcc gcc gaa acc cac gtc gac cgc tcg atc acc ggc tcg | 288 |
| Val His Phe Ala Ala Glu Thr His Val Asp Arg Ser Ile Thr Gly Ser | |
| 85 90 95 | |
| gac gcc ttc gtg atc acc aac gtg gtc ggc acc aac gtg ctg ctg cag | 336 |
| Asp Ala Phe Val Ile Thr Asn Val Val Gly Thr Asn Val Leu Leu Gln | |
| 100 105 110 | |
| gcc gcg ctc gac gcc gag atc ggc aag ttc gtg cac gtt tcc acc gac | 384 |
| Ala Ala Leu Asp Ala Glu Ile Gly Lys Phe Val His Val Ser Thr Asp | |
| 115 120 125 | |
| gag gtc tac ggc tcc atc gag gac ggc tcg tgg ccc gaa gac cac gcg | 432 |
| Glu Val Tyr Gly Ser Ile Glu Asp Gly Ser Trp Pro Glu Asp His Ala | |
| 130 135 140 | |
| ctg gag cgg aat tcc ccg tac tcg gcg gcg aaa gcg ggc tcg gac ctg | 480 |
| Leu Glu Pro Asn Ser Pro Tyr Ser Ala Ala Lys Ala Gly Ser Asp Leu | |
| 145 150 155 160 | |
| ctg gcc cgc gcc tac cac cgc acc cac gga ctg ccg gtg tgc atc acc | 528 |
| Leu Ala Arg Ala Tyr His Arg Thr His Gly Leu Pro Val Cys Ile Thr | |
| 165 170 175 | |
| cgc tgc tcc aac aac tac ggg ccc tac cag ttc ccg gag aag gtg ctg | 576 |
| Arg Cys Ser Asn Asn Tyr Gly Pro Tyr Gln Phe Pro Glu Lys Val Leu | |
| 180 185 190 | |
| ccg ctg ttc atc acg aac ctg atg gac ggc agc cag gtg ccg ctc tac | 624 |
| Pro Leu Phe Ile Thr Asn Leu Met Asp Gly Ser Gln Val Pro Leu Tyr | |
| 195 200 205 | |
| ggc gac ggg ctc aac gtg cgg gac tgg ctg cac gtc agc gac cac tgc | 672 |
| Gly Asp Gly Leu Asn Val Arg Asp Trp Leu His Val Ser Asp His Cys | |
| 210 215 220 | |
| cgg ggc atc cag ctg gtg gcc gac tcc ggg cgc gcg ggc gag atc tac | 720 |
| Arg Gly Ile Gln Leu Val Ala Asp Ser Gly Arg Ala Gly Glu Ile Tyr | |
| 225 230 235 240 | |
| aac atc ggc ggc ggc acc gag ctg acc aac aac gag ctg acc gag cgg | 768 |

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| Leu Leu Ala Glu Leu Gly Leu Asp Trp Ser Val Val Arg Pro Val Thr | | |
| 260 | 265 | 270 |
| gac cgc aag ggc cac gac cgc cgc tac tgc gtg gac cac agc aag atc | 864 | |
| Asp Arg Lys Gly His Asp Arg Arg Tyr Ser Val Asp His Ser Lys Ile | | |
| 275 | 280 | 285 |
| gtc gag gaa ctg ggg tac gcg ccg cag gtc gac ttc gag acc ggg ctg | 912 | |
| Val Glu Glu Leu Gly Tyr Ala Pro Gln Val Asp Phe Glu Thr Gly Leu | | |
| 290 | 295 | 300 |
| cgc gag aca atc cgc tgg tac cag gac aac cgg gac tgg tgg gag ccg | 960 | |
| Arg Glu Thr Ile Arg Trp Tyr Gln Asp Asn Arg Asp Trp Trp Glu Pro | | |
| 305 | 310 | 315 |
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| Leu Lys Ala Arg Ser Ala Val Ala Arg | | |
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<210> 53
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 <212> PRT
 <213> Saccharopolyspora spinosa

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| Cys Asp Arg Glu Leu Val Gly Gly Leu Met Ser Gly Val Asp Val Val | |
| 65 70 75 80 | |
| Val His Phe Ala Ala Glu Thr His Val Asp Arg Ser Ile Thr Gly Ser | |
| 85 90 95 | |
| Asp Ala Phe Val Ile Thr Asn Val Val Gly Thr Asn Val Leu Leu Gln | |
| 100 105 110 | |
| Ala Ala Leu Asp Ala Glu Ile Gly Lys Phe Val His Val Ser Thr Asp | |
| 115 120 125 | |
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| 130 135 140 | |

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 145 150 155 160
 Leu Ala Arg Ala Tyr His Arg Thr His Gly Leu Pro Val Cys Ile Thr
 165 170 175
 Arg Cys Ser Asn Asn Tyr Gly Pro Tyr Gln Phe Pro Glu Lys Val Leu
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 Pro Leu Phe Ile Thr Asn Leu Met Asp Gly Ser Gln Val Pro Leu Tyr
 195 200 205
 Gly Asp Gly Leu Asn Val Arg Asp Trp Leu His Val Ser Asp His Cys
 210 215 220
 Arg Gly Ile Gln Leu Val Ala Asp Ser Gly Arg Ala Gly Glu Ile Tyr
 225 230 235 240
 Asn Ile Gly Gly Gly Thr Glu Leu Thr Asn Asn Glu Leu Thr Glu Arg
 245 250 255
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 260 265 270
 Asp Arg Lys Gly His Asp Arg Arg Tyr Ser Val Asp His Ser Lys Ile
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 Val Glu Glu Leu Gly Tyr Ala Pro Gln Val Asp Phe Glu Thr Gly Leu
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 <213> Saccharopolyspora spinosa

<220>
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 Ser Glu Leu Ala Arg Ile Leu Pro Ala Arg Thr Gly Ala Leu Val His
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| | |
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| gac gcg ttg ggt tcc ttc gcg gag acg gcg aag gac gcg gag ctg cga Asp Ala Leu Gly Ser Phe Ala Glu Thr Ala Lys Asp Ala Glu Leu Arg 50 55 60 | 192 |
| ccg gtg gtg atc aac gcc gcg gcg tac acg gcg gtg gac gcg gcc gag Pro Val Val Ile Asn Ala Ala Ala Tyr Thr Ala Val Asp Ala Ala Glu 65 70 75 80 | 240 |
| tcc gac ccg gac cgc gcg gcc cgg atc aac gcc gaa ggc gcg gcc tcg Ser Asp Pro Asp Arg Ala Ala Arg Ile Asn Ala Glu Gly Ala Ala Ser 85 90 95 | 288 |
| ctg gcg aaa gcg tgc cgg agc agc ggt ctg ccc ctg gtg cac gtg tcg Leu Ala Lys Ala Cys Arg Ser Ser Gly Leu Pro Leu Val His Val Ser 100 105 110 | 336 |
| acg gat tac gtg ttc ccc ggt gat ggg gcc cgg ccg tac gag ccg acg Thr Asp Tyr Val Phe Pro Gly Asp Gly Ala Arg Pro Tyr Glu Pro Thr 115 120 125 | 384 |
| gac ccg acc ggg ccg cga tcg gtc tac ggg cgc acc aag ctc gaa ggc Asp Pro Thr Gly Pro Arg Ser Val Tyr Gly Arg Thr Lys Leu Glu Gly 130 135 140 | 432 |
| gaa ccg gcc gtg ctg gag tcc ggc gcg cgg gcc tgg gtg gtg cgc acg Glu Arg Ala Val Leu Glu Ser Gly Ala Arg Ala Trp Val Val Arg Thr 145 150 155 160 | 480 |
| gca tgg gtg tac ggc gcg agc ggc aag aac ttc ctg aaa acg atg atc Ala Trp Val Tyr Gly Ala Ser Gly Lys Asn Phe Leu Lys Thr Met Ile 165 170 175 | 528 |
| cgc ctc tcg ggg gag cgc gac acg ctg tcc gtt gtg gac gat cag atc Arg Leu Ser Gly Glu Arg Asp Thr Leu Ser Val Val Asp Asp Gln Ile 180 185 190 | 576 |
| ggc tcg ccg act tgg gcg gcg gac ctg gcg agc ggc ctg ctg gag ctg Gly Ser Pro Thr Trp Ala Ala Asp Leu Ala Ser Gly Leu Leu Glu Leu 195 200 205 | 624 |
| gcc gaa ccg gtc gcc gaa cgc cgt gga ccg gag cag aag gtg ctg cac Ala Glu Arg Val Ala Glu Arg Arg Gly Pro Glu Gln Lys Val Leu His 210 215 220 | 672 |
| tgc acc aat tcc ggc cag gtg acc tgg tac gag ttc gcg cgg gcg atc Cys Thr Asn Ser Gly Gln Val Thr Trp Tyr Glu Phe Ala Arg Ala Ile 225 230 235 240 | 720 |
| ttc gcg gaa ttc ggc ctg gac gag aac cgc gtc cac ccg tgc acg acg Phe Ala Glu Phe Gly Leu Asp Glu Asn Arg Val His Pro Cys Thr Thr 245 250 255 | 768 |
| gcg gac ttc ccc ctc ccg gcg cac cgc ccg gcc tac tcg gtc ctg tcc | 816 |

Ala Asp Phe Pro Leu Pro Ala His Arg Pro Ala Tyr Ser Val Leu Ser
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gac gtg gcg tgg cga gag gcg ggc ctg acc ccg atg cgc acc tgg cgg 864
 Asp Val Ala Trp Arg Glu Ala Gly Leu Thr Pro Met Arg Thr Trp Arg
 275 280 285

gaa gcc ctg gcg gcg gcc ttc gag aaa gac ggc gaa acc ctc cga acc 912
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cgc tga 918
 Arg
 305

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<400> 55
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 20 25 30

Arg Pro Gly Ser Gly Glu Leu Asp Val Thr Asp Ala Glu Glu Val Ala
 35 40 45

Asp Ala Leu Gly Ser Phe Ala Glu Thr Ala Lys Asp Ala Glu Leu Arg
 50 55 60

Pro Val Val Ile Asn Ala Ala Ala Tyr Thr Ala Val Asp Ala Ala Glu
 65 70 75 80

Ser Asp Pro Asp Arg Ala Ala Arg Ile Asn Ala Glu Gly Ala Ala Ser
 85 90 95

Leu Ala Lys Ala Cys Arg Ser Ser Gly Leu Pro Leu Val His Val Ser
 100 105 110

Thr Asp Tyr Val Phe Pro Gly Asp Gly Ala Arg Pro Tyr Glu Pro Thr
 115 120 125

Asp Pro Thr Gly Pro Arg Ser Val Tyr Gly Arg Thr Lys Leu Glu Gly
 130 135 140

Glu Arg Ala Val Leu Glu Ser Gly Ala Arg Ala Trp Val Val Arg Thr
 145 150 155 160

Ala Trp Val Tyr Gly Ala Ser Gly Lys Asn Phe Leu Lys Thr Met Ile
 165 170 175

Arg Leu Ser Gly Glu Arg Asp Thr Leu Ser Val Val Asp Asp Gln Ile
 180 185 190

Gly Ser Pro Thr Trp Ala Ala Asp Leu Ala Ser Gly Leu Leu Glu Leu
195 200 205

Ala Glu Arg Val Ala Glu Arg Arg Gly Pro Glu Gln Lys Val Leu His
210 215 220

Cys Thr Asn Ser Gly Gln Val Thr Trp Tyr Glu Phe Ala Arg Ala Ile
225 230 235 240

Phe Ala Glu Phe Gly Leu Asp Glu Asn Arg Val His Pro Cys Thr Thr
245 250 255

Ala Asp Phe Pro Leu Pro Ala His Arg Pro Ala Tyr Ser Val Leu Ser
260 265 270

Asp Val Ala Trp Arg Glu Ala Gly Leu Thr Pro Met Arg Thr Trp Arg
275 280 285

Glu Ala Leu Ala Ala Ala Phe Glu Lys Asp Gly Glu Thr Leu Arg Thr
290 295 300

Arg
305